TECHNOLOGY DEPT.

Light and Lighting

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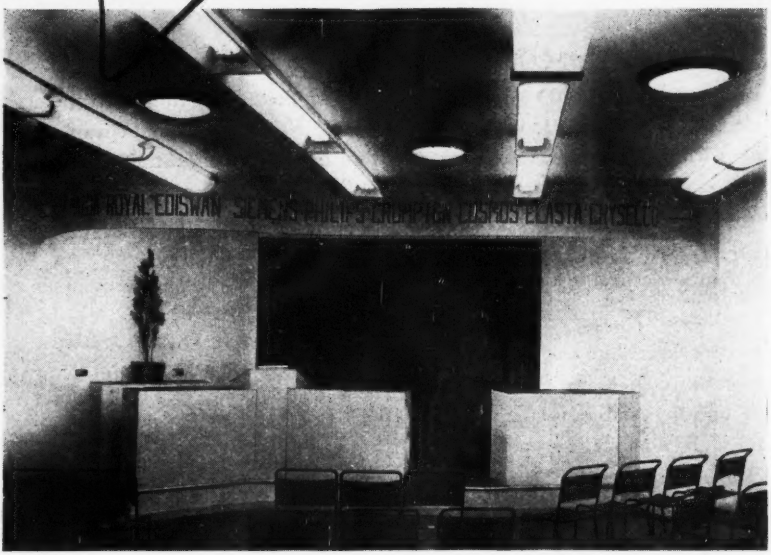

The lecture theatre stage in the new Mid-East England Lighting Service Bureau in Leeds. This Bureau is now the regular meeting place for local I.E.S. members and since being opened in September by the Lord Mayor of Leeds has been receiving an ever-increasing number of lighting enthusiasts.

The Aim

The aim of the Lighting Service Bureaux is to promote the full and proper use of light in the service of the community.

The Lighting Service Bureau of the Electric Lamp Manufacturers' Association, 2, Savoy Hill, London, W.C.2.

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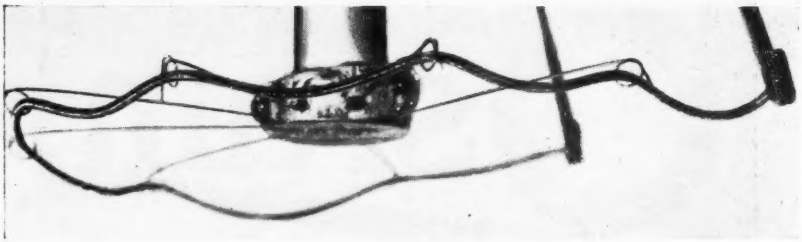
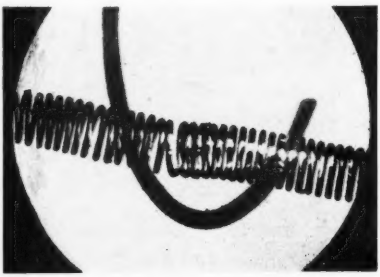
A

Lighting Development and Research



Enlarged photographs of a coiled tungsten filament. That above shows how, when the lamp is burning in the correct position with the cap upwards, the filament lies on the single-wire portion of the support loops. On the right, a highly magnified view of a coil from a damaged lamp illustrates a degree of distortion which, in a new filament, would ensure immediate rejection by the inspectors.



Filaments

Few people realise the care and precision which goes into the manufacture of electric lamps. Filament making, for instance, is complicated enough, but that is only part of the work involved.

In the first place the production of the 99.9 per cent. pure tungsten powder from the ore *wolfram* necessitates a long and complicated process. Pressing and fusing this powder into a more or less solid bar, then "swaging" it so that it can be handled by the wire-drawing machinery, and finally drawing it through a series of diamond dies are some of the processes which go to transforming a 16 inch "slug" of metal into a wire which though now several miles long will maintain its strength and rigidity at temperatures exceeding 2,500°C.

Coiling, too, is an intricate art, while coiled-coiling is something which cannot even be seen by the naked eye. And at the end of all these processes, if one single coil is distorted the filament is rejected. The degree of accuracy demanded is one which few industries could achieve, and yet it is there in every lamp made by a member of E.L.M.A.

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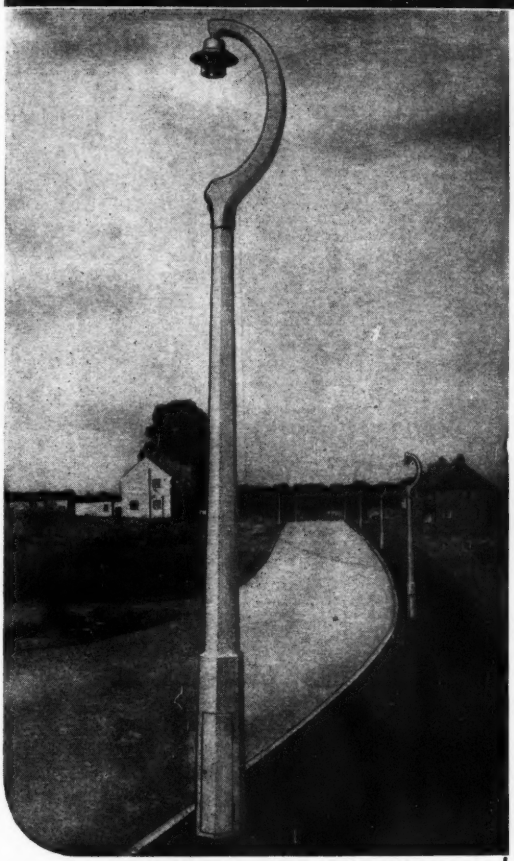

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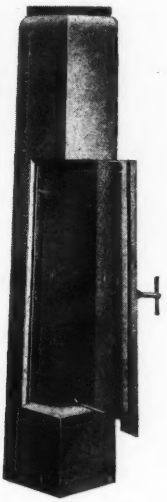

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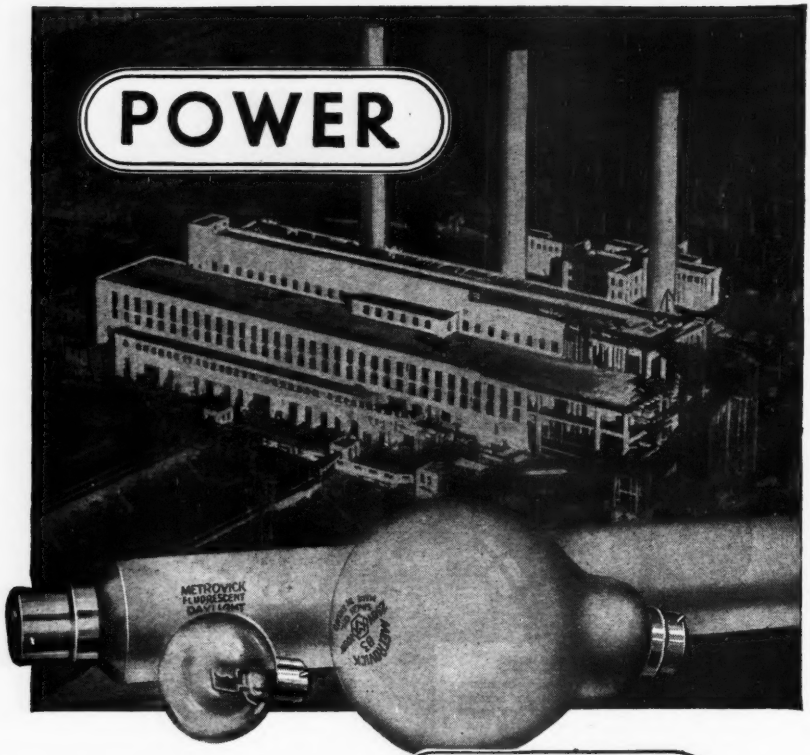

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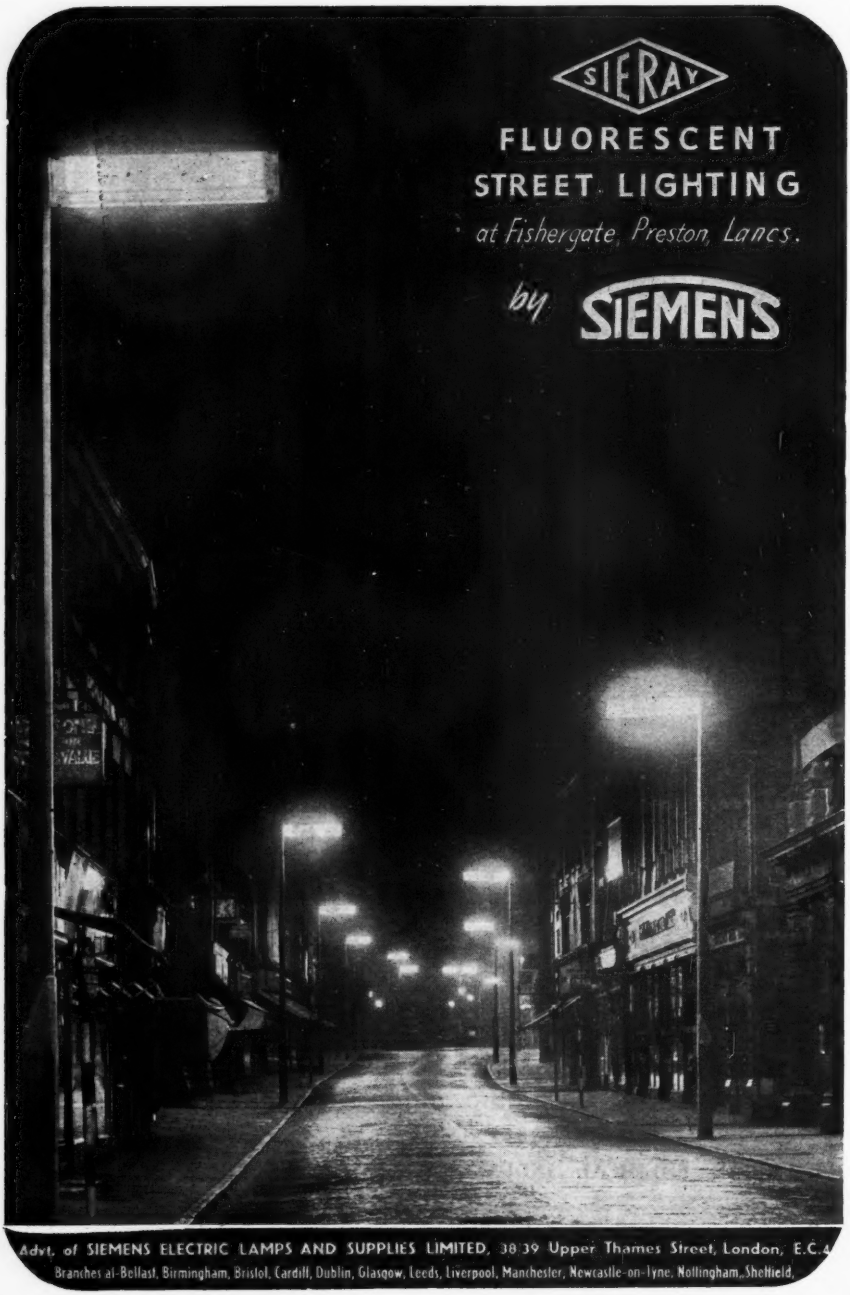

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Lighting the Roads

WITH the approach of winter and with memories of this year's A.P.L.E. conference fresh in their minds many of our readers will now be concentrating their attention on the various aspects of street lighting. This subject is therefore featured in this issue, which includes a number of articles on public lighting matters in addition to a report on the recent A.P.L.E. conference.

Though perhaps there has not recently been any spectacular expansion in this field, street lighting techniques in this country are still the envy and admiration of visiting lighting engineers from other countries. Nevertheless, as Dr. Aldington points out in his Presidential Address to the I.E.S., we should not forget that it is at times of limited activity that we have the opportunity to take stock of our present knowledge and decide in which direction the next advance should be made.

Illumination Notes and News

Trotter-Paterson Memorial

In June last year, we announced the establishment of the Trotter Memorial Lecture and the appeal for a special fund to finance it. This appeal was withdrawn soon afterwards because the sudden death of Sir Clifford Paterson in July, 1948, led the Council of the Illuminating Engineering Society to link his name with that of Mr. Trotter. Both Paterson and Trotter made outstanding contributions to the practice of illuminating engineering and both were leaders in the development of the Society.

A new appeal for funds was announced by the I.E.S. President on October 11 and a personal approach will be made early in November to each member of the Society to contribute a small amount. The funds will be invested by the Council and the interest will be used to finance a series of public lectures, given alternately as the "Trotter Memorial" and the "Paterson Memorial" on subjects of a general character, dealing with pioneer work or with some broad review of developments or knowledge.

It is confidently anticipated that these lectures will do credit to the standing of the Society because it is hoped that the response to this appeal will enable the Society to choose the lecturers from amongst the leading men in a wide field of science and technology.

Mr. A. P. Trotter was a member from the foundation of the I.E.S. in 1909 until his death and he was President for three critical years at the end of the 1914-18 war. He was the first chairman of the D.S.I.R. Committee on Illuminating Engineering in 1917 and, when the war was over, he led a deputation which paved the way for the Committee on Illumination Research. Mr. Trotter's work formed the basis for the close collaboration between the Government and the Lighting Industry which developed while the industry was itself growing during the post-war years.

Sir Clifford Paterson was another pioneer in the knowledge and techniques of lighting and he founded the great Research Laboratories of the General Electric Company, primarily to deal with problems of electric lamps. He was one of the founders of the International Commission on Illumination and was its Honorary Secretary for many years. He was President of the Society in 1928-29 and

Next I.E.S. Sessional Meeting in London

The next I.E.S. Sessional meeting in London will be held at the Lighting Service Bureau, 2, Savoy-hill, W.C.2, at 6 p.m. on Tuesday, November 8.

The paper to be presented at this meeting will be "Specialised and General Lighting in Hospitals," by M. W. Peirce and D. J. Reed. The paper will discuss some of the special lighting problems in hospitals and suggest ways in which they may be solved. Particular attention is given to lighting in operating theatres.

continued as a most active supporter of the aims and objects of the Society up to the very end of his life.

The Society no longer depends on the leadership of a few outstanding men, as it did for many years, but it is well for us to remember the great contribution that they made during the early years. The names of Trotter and Paterson can be an inspiration to those who serve the Society now and it is very fitting that a scheme of Memorial Lectures will keep their memory fresh for years to come. We commend the appeal to each member of the Society and we express the hope that each one will find some way of showing his support.

At the time when the Council of the I.E.S. were considering the form of this Memorial the Society and the lighting world suffered yet another grievous loss by the death of Mr. J. S. Dow, who had been the mainstay of the I.E.S. for many years. We understand that no appeal is being made to set up a Memorial Fund for Mr. Dow as Mr. Dow made a bequest to the Society amounting to almost £2,000. We gather that the manner in which this legacy is to be used is now being considered, but we may be certain that it will be used in some manner to perpetuate the memory of one who did so much for the Illuminating Engineering Society and to whom the lighting industry owes so much.

Individuals and bodies who are not members of the I.E.S. may also contribute towards the Trotter-Paterson Memorial Fund. Contributions should be sent to the Honorary Treasurer of the I.E.S., 32, Victoria-street, London, S.W.1. Cheques should be crossed and made payable to the "Trotter-Paterson Memorial Lecture Fund."

C. & G. *Examinations*

Elsewhere in this issue we give the results of the City and Guilds examinations which were held last May. Compared with the 1948 results, although fewer students passed the Intermediate grade exam. (62 against 98 last year) more students passed the Final grade examinations. The figures for 1948 were six passes in Section "A" and 20 in Section "B"; this year the figures are 20 and 28 respectively. We congratulate those who passed these examinations and wish every success to those taking up studies this year.

The increase in the number of students going on to take the final grade is encouraging. It shows that students realise that though there has been much talk about the Inter. exam. this grade is only the half-way stage in their studies. At present the I.E.S. require only the Intermediate certificate as a qualification for inclusion on the Register of Lighting Engineers. It is quite possible, however, that sooner or later they will demand the Final grade certificates and students who are now going on to obtain these certificates are, we think, doing the wise thing.

The increase in the number of students taking the Final exams. and the decrease in those taking the Inter. seems to indicate that there are insufficient students to take both types of course or there are difficulties in getting suitable lecturers to run both courses at the same time. In these circumstances it may be a good thing for courses to be organised so that students take the Inter. exam. the first year and continue their studies during the second year to take the Final examinations.

One word, in passing, on the Register. It has been suggested that it would add to the status of the Register if firms advertising jobs required applicants to be on the Register. Well, we already have knowledge that being on the Register is an asset to an applicant for a position with a lighting firm; it may, however, be a little time before one can fairly expect firms to demand this qualification.

Lighting the M.V. Rangitoto

The New Zealand Shipping Company's new passenger and refrigerated cargo motorship Rangitoto left Tilbury on her maiden voyage to New Zealand on August 25. All the lighting equipment for the ship was supplied by The General Electric Co., Ltd., and in many of the public rooms pleasing and novel effects are obtained by blending the light from cold cathode tubes of various colours with that from tungsten lamps.

Most of the cold cathode lighting is indirect, the tubes being concealed in cornices. All the tungsten lighting fittings have silver bronze metalwork. Where tinted glass is used it is peach colour. The designs, 27 in all, were prepared by the architects, Messrs. Easton and Robertson, F.F.R.I.B.A., Chartered Architects, and carried out by the G.E.C.

Special attention was paid to obtaining in the dining saloon a lighting effect that would be at the same time complimentary to diners and fair to foodstuffs. By combining indirect lighting from ivory and gold cold cathode tubes with the general tungsten, a very acceptable blend of colours has been obtained.

Other large circular fittings are used in the large lounge and bar. These have an obscured peach colour glass dish 3 ft. 6 in. in diameter, and each contains six 100-watt tungsten lamps. Standard lamps in the large lounge are in polished birch or silver bronze and are fitted with the four-lamp Partridge device which enables some indirect lighting to be obtained by reflection from the ceiling when desired.

Cold cathode lighting is used in the large lounge in conjunction with the circular ceiling fittings described above. The tubes are warm white, and are located in cornices at both ends of the lounge.

The large lounge, which has tungsten lighting in ceiling fittings and floor standards, and cold cathode tubes in cornices.

The dancing space has a combination of gold cold cathode and tungsten lighting. In this area 18 of the fittings are a circular design with a peach-tinted dish on which a star pattern is left as clear glass. Similar, but smaller, fittings are used in the verandah café.

Cold cathode lighting is also used in other parts of the ship. Four special designs of ceiling, table and writing desk fittings were perpared for the private suites.

METHODS OF FACILITATING VISUAL TASKS

By H. C. WESTON

Part 2

(Part I of this article appeared in the September issue)

The Means of Facilitation

(iv) *Visual Skill*

By the habitual direction of attention to particular objects, we acquire such familiarity with their appearance in detail that we recognise them very readily and rapidly when they are presented to view along with other objects; and we discriminate with great facility between objects of similar general appearance which exhibit small differences. Even if our eyesight is no better than another person's, or is even inferior, we may acquire greater power of discrimination in certain directions, owing to training, practice and interest.

This special discrimination is *visual skill*, and is to be distinguished from acuity which Parsons has properly called a *visual capacity*. It is unfortunate that some contributors (not in this country) to ophthalmic literature refer to physiological visual capacities as "visual skills."

Visual skill is a most potent facilitator of occupational visual tasks, and it is one which the individual must obtain for himself, though he can be helped in this by skilled instructors. Innumerable examples of the advantage given by visual skill could be cited. The experienced proof-reader sees a turned letter, or other typographical fault, much easier than the ordinary reader; to him the fault stands out as it were, "like an island from the sea"—to use a picturesque simile borrowed from Stout. The "bank-teller" spots a foreign coin among a collection of coins of similar size and metal more readily than other persons. So when, as Cicero remarked, "to sound and healthy senses *practice and skill* are added, who is there who can fail to see what great power there is in the senses?"

(v) *The Size of Work-Objects*

Everyone knows that the difficulty of visual tasks is affected by the apparent size of the objects which must be seen. In near work we are usually concerned with objects which are both physically and visually small in size, while, in teloramic work, we may be concerned with objects which, though physically large, subtend a very small angle at the eye. Investigations have shown to what extent the performance of a visual task may be facilitated, or impeded, by varying, within certain limits, the size of what has to be seen, and some of the results obtained are plotted in Fig. 3. From this diagram, it can be seen that, at any level of illumination, visual performance is greatly increased by doubling the size of the critical detail—from 1.5 minutes to 3.0 minutes—and again by increasing the size from 3.0 minutes to 4.5 minutes. Further facilitation is afforded if the detail is made larger still but, for tasks of the kind considered, there is little to be gained by making its angular size greater than 10 minutes.

Sizes within the limits mentioned are those found in a very wide variety of practical visual tasks, and Fig. 3 shows that a great change of illumination does not affect the performance of "fine" and "very fine" work so much as would a far smaller change of size. The size of the objects used in some occupations need not be made as small as it now is, and substantial facilitation of the work would result if these objects were made 25 per cent. or 50 per cent. larger. But, when actual enlargement is im-

possible, optical magnification will be equally efficacious.

(vi) *Contrast as a Facilitator*

It is only by contrast of brightness or colour that one object can be distinguished from another in the visual field, and discrimination is easy or difficult according to the degree of this contrast. The contrast is due to the different amounts of illumination received by different objects, or to differential reflection by the latter, or to both of these factors. Thus, within limits, contrast is controllable by lighting, though it is often possible, also, to arrange that the objects of inspection shall be seen against a background material of suitably different reflection factor. Much can be done to facilitate visual tasks by using these methods for improving contrast.

The contrast sensitivity of the eye varies with its state of adaptation, and so, if there is little difference of reflectivity between an object and its surrounds, the contrast thus presented is less effective in a poor than in a good light, and may not be apparent at all. The effectiveness of a given difference of reflectivity between an object and its background also depends on the apparent size of the object, so that the smaller the detail which has to be seen the more important it is to make this difference large; for example, the smaller the type-face used in printing the more important it is to avoid using grey or tinted paper and other ink than black. Fig. 3 shows the effect of different degrees of contrast upon the performance achieved in tasks requiring discrimination of differently sized detail. It can be seen that a given change of contrast has a relatively greater effect upon visual performance as the size of detail to be seen is reduced.

The use of colours is often feasible for the purpose of creating contrasts or bettering "natural" contrasts of low values. Temporary colouring of the surface the worker has to view has long been practised in some occupations. For example, the tool maker often "blues" a piece of metal before he marks it out for working, so that when he has scribed it the lines will show up brightly on the blued background. Again, the histologist and the pathologist stains the tissue sections he wishes to examine, so as to create the contrasts necessary to reveal structural details. In calico printing there is a process known as "sightening," which consists in adding a fugitive, i.e., impermanent, colour to the material to enable the printer to judge the quality of the work.

This method of enhancing contrast, and so facilitating visual tasks, could be used much more widely than it is. In many industrial operations, objects and materials are needlessly processed in

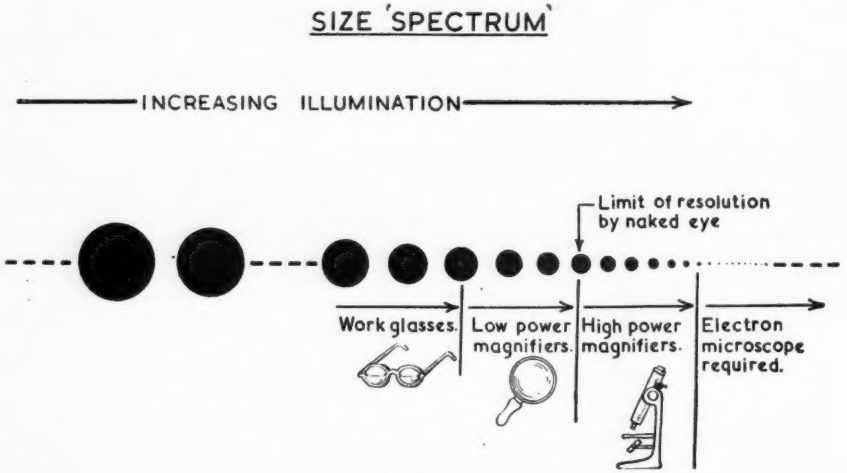


Fig. 5.

their "natural" state, in which they do not contrast well with the bench, machine, or other surrounds, in which they are seen. However, interest is growing in the use of colour in industry, both for amenity and for assisting visual discrimination.

(vii) *Optical Facilitators*

The use of optical aids to vision may be necessary for teloramic as well as for ancoramic work. The telescope and the range-finder are examples which at once come to mind for the facilitation of teloramic tasks. But it is work with near sights which chiefly gives rise to "eyestrain," and, besides their function of magnification, optical aids for ancoramic work are ocular muscle labour-savers.

If we consider the size "spectrum" covered by visual tasks (Fig. 5), it is evident that the only means of facilitation required when size is large is a suitable intensity of illumination. As the size of the detail involved in the task becomes smaller and smaller, down to the limit of the eye's resolving power at the near point, it remains possible to do the work, providing the illumination is progressively increased. But, before this limit is reached, the difficulty of the work—chiefly on account of the effort of accommodation and convergence, and the limitation of eye movements, it demands—becomes so considerable that additional facilitation by optical means is desirable.

The most familiar optical aid is the simple hand-magnifier, or reading-glass, and for occasional use it is often convenient and adequate. It is obviously unsuited for use when an enlarged view of the work-objects is needed while both hands are engaged in acting upon these objects. However, self-supporting magnifiers are available in a great variety of mounts and, of course, both hands are free if other devices are used, such as the watchmaker's glass or any of the spectacle or headband loupes.

The self-supporting magnifier is a useful aid when the objects to be inspected are stationary and at a fixed distance from the glass. For viewing moving objects, and objects which are undergoing manipulation and varying in their distance from the lens, such a glass is generally unsuitable, and may increase the difficulty of the visual task. Distortion of the field may also be disturbing, though, with the advent of suitable transparent plastics, aspheric lenses, which introduce little distortion, can be made relatively cheaply. The objection to the watchmaker's glass is that the wearer has to sacrifice the advantage in depth perception which is normally afforded by binocular vision. Since the microscope brings within the capacity

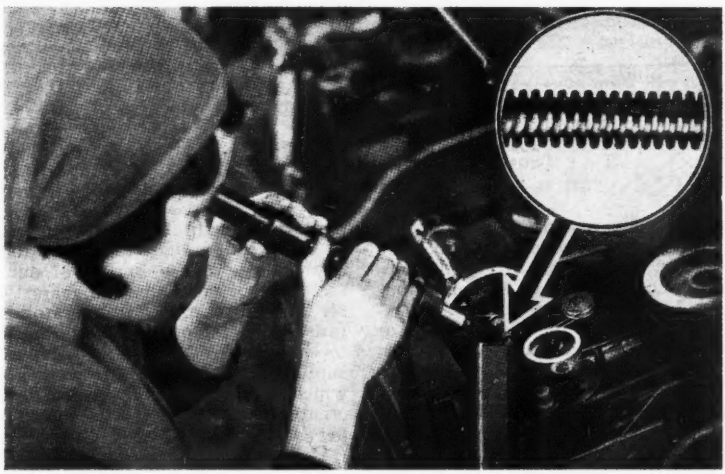


Fig. 6.

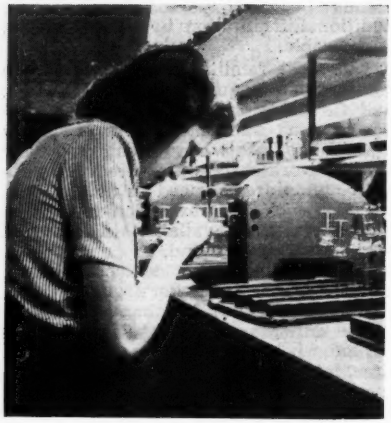


Fig. 7.

visual tasks, such as the examination of screw-thread contours and the spacing of radio valve grid wires.

There are, however, many visual tasks in industry which can be facilitated by virtually increasing the viewing distance so that the work becomes mesoramic instead of ancoramic. For this purpose low power lenses, with suitable prisms, are worn in the usual spectacle position. Typical of these tasks is that of the girl shown in Fig. 7 who is preparing to weld an electrode in a radio-valve assembly. The investigations of Weston and Adams, described in publications of the Industrial Health Research Board from 1927 to 1929, have shown the value of this method of facilitation, and Fig. 8 illustrates the effect observed in the case of linkers in the hosiery industry. Since these investigations were made, this

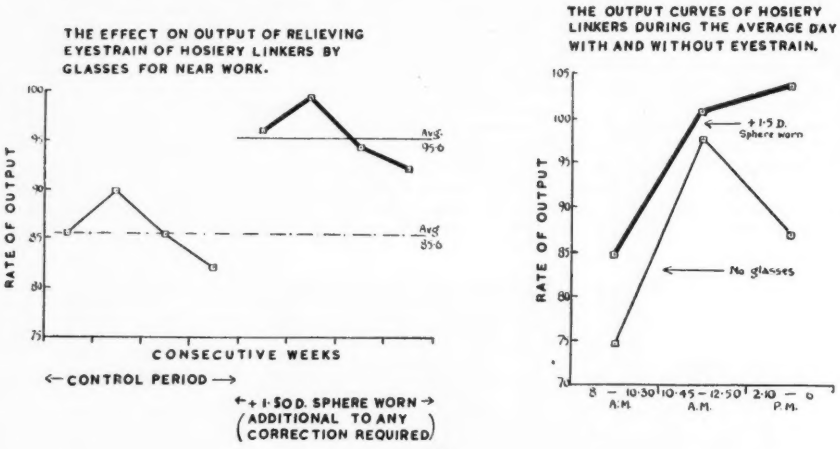


Fig. 8.

of vision objects and detail which could not otherwise be seen, it is both a creator and a facilitator of visual tasks. Its use is not confined to the laboratory and the bench, and Fig. 6 shows an instrument mounted on a machine for coiling the very fine filaments used in electric lamps. It is only by this means that the operator is able to keep an eye upon the work in progress, so that she can stop the machine for adjustment if it is seen that coiling is not proceeding satisfactorily. The projector is another optical device available for facilitating

method of facilitation has been adopted in American hosiery factories, and has now been in use in one of our own factories for more than 20 years. Quite recently, a number of operators in a radio-valve factory, doing work similar to that illustrated in Fig 6, have been supplied with similar work-glasses, which, in some cases, have led to an increase of efficiency of as much as 10 per cent.

It should, of course, be borne in mind that emmetropes become artificially myopic while wearing these glasses if

full lenses are worn. This is undesirable and would, in fact, impede the work if the operator needs to have distinct vision over distances considerably greater than the characteristic short viewing distance. In any case, it is desirable that the wearer should be able to see clearly without removing the glasses when a distant view is desired. For these reasons, lower-half lenses should be used, as illustrated, for example, in Fig 9.

(viii) *Mechanical Facilitators*

It is sometimes possible to employ mechanical devices for ameliorating visual tasks. The pantograph, which enables a diesinker, or an engraver, to use a large and easily seen pattern to guide him in producing a small die or engraved detail, is an example of such a device. Gauges in which small movements of the "feelers" are mechanically amplified, so that the scale the user has to read can be a large and open one instead of a very fine one, may also be cited. Besides these devices, special "jigs" can be designed for particular operations in order to reduce the visual precision required of the operator. An example of such a jig is shown in Fig. 10. It is used in the course of the operation of welding a very fine wire hook on to one of the supports of a small valve grid. The hook has to be positioned exactly between two turns of wire at the middle of the grid, and it must project only a small and precisely determined distance on the inner side of the grid support. It can be imagined how difficult this job would be without some aid but, as the illustration shows, the jig is so designed that the operator sees a flared groove, and is able to position the hook precisely by "feel," when it has been entered into the groove.

(ix) *Organisation in Work-Sights*

Motion study has led to improvements in the layout of materials and tools for many jobs, and so to much economy of muscular effort, and to increased productivity. Where it has been applied the result has often, and not surprisingly, also been facilitation of the work from the visual standpoint. The proper organisation of the work as a sight or view is an essential step in any thoroughgoing attempt to promote industrial welfare and efficiency, and it

Fig. 9.

should, therefore, be undertaken deliberately. The same care needs to be taken to present the work effectively to the worker as the advertiser is wont to take in order to facilitate the public absorption of visual information about what he has to sell. This involves consideration not only of separate elements of the work-view, but also of the view as a whole. Had they lived in an industrial age like our own, the Greeks of the Alexandrian School, might well have included the principles of work-view design in that branch of optics (the science of *sight and light*) which they termed "scenegraphy."

By stabilising some part of the objective pattern which a job presents, the recognition of its individual characteristics ultimately becomes a subconscious process, and the time and effort the

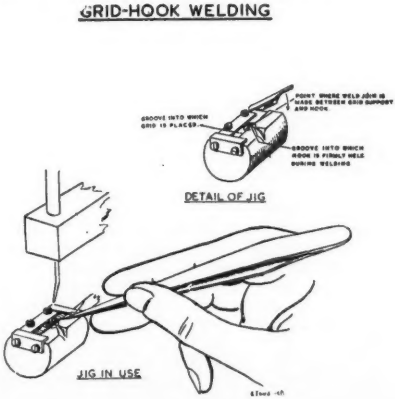


Fig. 10.

novice expends in closely scrutinising it is no longer necessary when the pattern has been learnt. Reading, of course, is one of the most familiar examples of a visual task which is facilitated in this way. But, in other cases, stabilisation may convert what is, at first, a regular visual task into a very occasional one. For example, the keyboards of typewriters, composing machines, accounting machines, and the like, as well as the pattern of the compositor's type-case are stabilised, and are seldom inspected when they have been thoroughly visualised. Patterns of movement of the arms and fingers are developed to conform to the layout of the keyboard, and, thenceforward, visual attention can be devoted almost exclusively to other parts of the working area.

In some other kinds of jobs constancy of layout cannot reduce the field to be scrutinised in the same way, but still the visual task may be facilitated by good organisation. Thus, the instruments in an aircraft should be grouped so that the pilot's eyes have easiest access to those instruments on which he most relies, the others being more or less favourably located according to their individual importance. As far as possible it should be made unnecessary for the worker to search out the parts of a work-sight with which his attention ought chiefly to be engaged. He should be aided by a well-designed layout. The eyes should not be encouraged, by the presence of irrelevant and distracting objects, to wander too much from point to point in the work-field but, rather, to come to rest frequently upon the principal objects for the job in hand. Visual artists are skilled in leading the eyes to dwell on those features of their pictures which they most desire the viewer to appreciate, and those who plan work-sights in factories and offices need to cultivate a similar skill.

Owing to their structural features, some industrial machines impose difficult visual tasks upon their operators, and this aspect of machine design deserves more serious consideration than is often given to it. In offices, forms of all kinds should be carefully designed, so that the most important items can be easily found and held in view, and the eyes can move smoothly from one to another. Apart from the size of letters and numerals and their contrast with the paper, spacing is an important factor in relation to the facility of reading. Tables of figures can be extremely tiring in use unless the figures are broken up into easily manageable groups, that is, into focal fields, to any one of which the gaze readily clings until the desired figures are located.

In conclusion, I would emphasise the need for a proper understanding of the nature of particular visual tasks if the most suitable methods of facilitation are to be applied. Illumination is essential for all visual tasks, but various other means of facilitation are available and desirable, so that those of us who may be chiefly concerned with one means will do well to appreciate the value of the others, and to recognise the limitations of each.

Fluorescent Lighting at London Railway Stations

In order to effect a considerable improvement in the lighting at Charing Cross and Waterloo Stations, London Transport announce that work will soon commence on the replacement of the existing system by fluorescent "daylight" lamps.

At Charing Cross the ticket hall, subways, escalators, and tube platforms, as well as the District Line platforms, will be fitted with the new lighting, and at Waterloo the platforms, subways, escalators, and ticket hall, except for the York-road entrance.

The work of replacing this considerable amount of lighting equipment must necessarily be done outside ordinary traffic hours.

Colour Matching Lamps at Printing Inks Demonstration

In a move towards the adoption of standard inks by colour printers for four-colour letterpress process work, a demonstration was held on September 22 at B.S.I. in collaboration with the British Federation of Master Printers. The lighting of the room was carried out entirely by means of G.E.C. colour matching lamps and cold cathode tubes.

The display boards on which the colour proofs were exhibited at the B.S.I. demonstration were lit by 9-ft. cold cathode colour matching tubes in three-lamp fittings. General lighting of the room was carried out by 5-ft. colour matching lamps installed for the occasion in existing fluorescent fittings.

A.P.L.E. CONFERENCE
LLANDUDNO

Report on the proceedings and on the display of street lighting equipment.

The annual conference of the Association of Public Lighting Engineers was held at Llandudno from September 12 to 16, and was a special occasion in as much as it was the silver jubilee celebration of the Association. As the years have gone on so the status of the Association in particular and public lighting in general has increased, and with an attendance of some 1,000 members and de egates the A.P.L.E. conferences now hold their own with those of older allied bodies.

Annual General Meeting

The proceedings began on Monday afternoon, September 12, with, as usual, the annual general meeting, which was presided over by the retiring president, Mr. N. Boydell (South-Eastern Electricity Board: East Sussex and South-West Kent), and the first business was to send a message of sincere and loyal greetings to His Majesty the King at Balmoral. This was acknowledged later during the day.

It was announced that letters of good will had been received from Mr. S. B. Lang ands, the first president of the Association, and Captain W. J. Liberty, one of the founders and the first hon. secretary, and it was decided to send greetings to Mr. Langlands in acknowledgment.

The hon. treasurer (MR. H. C. BROWN) presented the accounts, which showed a balance of income over expenditure of £275 16s. 8d. for the year ended December 31, 1948. A vote of thanks was accorded to the hon. treasurer for his work last year and many preceding years.

The result of the ballot for officers and members of council for the ensuing year was announced as follows:—

President: Mr. A. S. TAPSFIELD (Corporation of the City of London).

Vice-President: Mr. P. RICHBELL (South-Eastern Gas Board, Croydon).

Hon. Treasurer: Mr. H. C. BROWN.

Members of Council: Mr. W. N. C. CLINCH, Mr. E. C. LENNOX, Mr. E. HOWARD, Mr. A. KELSO.

The next item of business concerned the proposed alterations in the Articles of Association, these being explained by the President and the solicitor to the Association. The principal alteration is intended to meet the situation which has arisen from the nationalisation of the gas and e ectricity industries. A new class of membership to be known as Group Members is proposed, and under the new Articles of Association gas and electricity Area Boards may become Group Members and appoint representatives to act on their behalf. At the same time the opportunity has

Mr. A. S. Tapsfield, President of the A.P.L.E. and Mr. P. Richbell, Vice-President.

been taken to bring the Articles of Association up to date and more in line with those of the senior engineering institutions and the provisions of the Companies Act, 1948, the ultimate aim being an application for a Charter. The Board of Trade has considered the new proposals and has made certain suggestions which have been embodied. Formal consent has not yet been given by the Board of Trade to the modified Articles.

The modified Articles were approved by the meeting. After they have been sanctioned by the Board of Trade an extraordinary general meeting of the Association will be called to give the new Articles formal approval.

Following the annual general meeting the Association was officially welcomed by Councillor A. Macfarlane (chairman of the Llandudno Urban District Council), who declared the conference open.

Then followed the induction of the new president (Mr. A. S. Tapsfield) and thanks to the retiring president (Mr. Boydell), who was presented with the presidential certificate and badge usually handed to retiring presidents. The new vice-president (Mr. P. Richbell) was then introduced to the meeting.

The PRESIDENT reported that the Council had decided to mark the silver jubilee celebration of the Association by offering hon. memberships to three founders of the Association who had not already received that distinction. They were Mr. G. Shapley (Leeds), president 1925-26; Mr. R. Davidson (Newcastle-on-Tyne), president 1927-28, and Mr. Thomas Wilkie (Leicester), president 1930-31 and again 1947-48.

This closed the proceedings of the first session, and a tour was made of the lamp columns, lanterns, and tower wagons displayed by various manufacturers on the promenade. The exhibits are described on pp. 270-6. On the Monday evening there was a civic reception by the chairman of the Llandudno Urban District Council at the Winter Garden which was attended by a large number of the delegates and their wives.

Presidential Address

On Thursday morning, September 13, the President delivered his address, the chief feature of which was a short historical review of street lighting in the ancient City of London to show how through the ages the City had taken a leading part in the progressive stages of this important public service. This survey went as far back as 1383, and to the time when a lantern was ordered to be hung outside every house along the highway, generally from dusk to 9 o'clock, "when the moon was dark." Reference was made to a "Standards Specification" for candles to be used in the lanterns and to the fact that in 1657 City Aldermen were ordered to supply lights in such places where the responsibility could not be placed on private householders—apparently the first occasion on which a municipality assumed responsibility for any part of street lighting.

This historical review covered the steps taken for the re-establishment of street lighting after the Great Fire of 1666, the appearance of the first glass-sided lanterns in Cornhill in 1683—and a complaint that the oil lamps in them gave "a glorious light but something too strong for weak eyes"—and so on to the installation of the first electric arc lamps and finally to the damage caused to the street lighting of the City of London during the last war. Approximately one third of the street lamps and apparatus was demolished or seriously damaged during the course of the war and a considerable amount of improvisation has been necessary in order to maintain a reasonable degree of illumination until such times as a new scheme can be devised and put into operation.

In a reference to the M.O.T. Departmental Committee's recommendations,

the President said that a drive for uniformity will inevitably lead to greater standardisation, though he thought that this could only be of real use if the standard set was a high one. A high standard of illumination, however, cannot possibly be achieved in many areas —particularly those of rural, urban and parish councils, whose financial difficulties are acknowledged by all concerned—without some assistance from national funds. Now that the gas and electricity industries are nationalised and the M.O.T. is established as the central authority for street lighting, the President expressed the hope that more attention will be focused on this problem, and said he felt that the appropriate time had now arrived for a new departmental committee to be set up for the purpose of considering this question.

The latter part of the address traced the development of the Association during its 25 years of existence, reflecting on past achievements in order to gain fresh inspiration for the future. The President recalled with gratitude the untiring efforts during the early constructional years of the first secretary—Captain Liberty—who was succeeded by the highly esteemed and popular hon. secretary of the Illuminating Engineering Society, the late Mr. John Dow. He mentioned also the smooth and efficient secretarial work of the late Mr. H. O. Davies, who followed Mr. Dow, adding that now Mr. Eric Evans is carrying on the excellent work in the best traditions of his predecessors.

A reference was made to the publication of the British Standards Specification for Street Lighting and a tribute paid to manufacturers for the manner in which they had supported the various conferences with exhibits of up-to-date street lighting equipment.

After speaking with feelings of justifiable pride and pleasure of the progress being made by the Scottish and Lancashire sections which have been formed during the past year, the President added that considerable satisfaction was to be found in the knowledge that the recent formation of the Belgian Public Lighting Commission was inspired by the experiences gained at the Association's conferences by M. Boereboom, the commission's first chairman.

Finally, the President said it would seem that the Association had now reached a decisive stage in its career, a situation brought about mainly by the transfer to public ownership of the gas and electrical industries. If might, therefore, be advantageous for the members of the Association to regard these changing conditions as a definite spur to further effort on the part of the Association.

The vote of thanks to the President for his address was moved by Mr. P. Richbell (the vice-president) and was seconded by Mr. E. C. Lennox.

Street Lighting Economics

A paper on "The Economics of Street Lighting" was then presented by Mr. NORMAN AXFORD, manager of the Harrow District of the Eastern Electricity Board, who dealt with the subject from the electrical point of view and based his calculations on the

Cllr. A. Macfarlane (Chairman of the Llandudno Urban District Council), Mrs. Macfarlane and Mr. and Mrs. Tapsfield at the Civic Reception.

assumption that lighting was from dusk to dawn throughout the year.

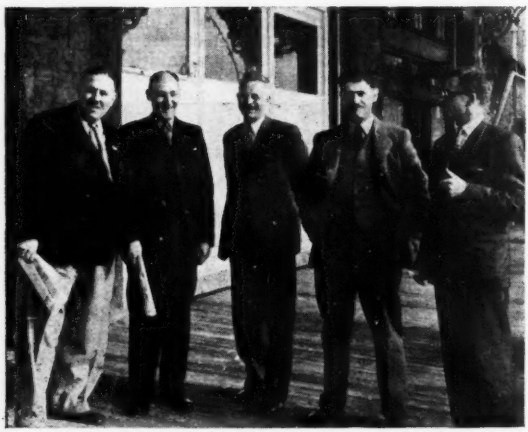
By means of a block diagram the author set out the annual cost per column for various types of lamps, each type being sub-divided to show the cost of various items, e.g., capital charges, lamp renewals, current, transport, repairs, control, scouting and cleaning. The author explained that the figures were his own and may not necessarily agree with those of other engineers; for example, a figure of 12½ per cent. was taken for capital charges, the charge for current was given as 0.925d. per unit, and the life of lamps was taken as 2,500 hours, with a hint that manufacturers should endeavour to make this 3,000 hours.

On the question of repairs and sundries, it was suggested that designers of modern fittings should concentrate on the following points: paintwork which does not flake off after 12 months' exposure; as few screws as possible (any that are absolutely necessary to be large ones and of the captive type that do not get lost when undone, though if possible, latches should be used in place of screws); refractor plates to be provided with internal prisms and smooth glass exteriors to save dirt lodging in the crevices, and to enable easy cleaning; metal work should be of stainless steel as corrosion of other metals causes difficult maintenance after some years' exposure; the design of a lock for the door in the base of the column which cannot be opened by unauthorised persons and yet does not need cumbersome keys for authorised ones; and the design of a fitting which will withstand malicious attacks and yet be of good appearance and an efficient source of light. The author said that "Perspex" appeared to offer some hope in this last connection although at a somewhat high price.

The conclusions arrived at by the author were: (1) generally some form of discharge lighting gives the most economical light output for a given annual sum; (2) annual costs can be quite appreciably reduced by lengthened life of discharge lamps, and it is hoped that further research will assist in this direction; (3) maintenance costs, although not representing too great a proportion of total annual cost, can be kept down by (a) careful organisation of the labour force into economical units; (b) adopting routine lamp changing after lamps have burned a specified life; (c) doing away with night scouting, and (d) design of more easily handled and more lasting equipment.

With only half an hour available for the discussion of this paper and 15 delegates wishing to take part, there was some high speed speaking, and quite a number of points were raised.

The problem of preventing malicious damage to street lighting fittings led to a little "leg-pulling" as to the degree of behaviour of the small boys and others who indulge in this pastime in various towns. For Sheffield, Mr. COLQUHOUN claimed he did not suffer to any extent, whilst Mr. C. C. SMITH, of Liverpool, thought the "fish basket" arrangement shown by the author would be accepted as a challenge, and that worse might follow. Mr. DOXEY, of Leeds, spoke of making appeals to the public through the cinemas, sticking labels on lamp posts and inserting notices in the Press, whilst another suggestion was that residents noticing damage should inform the police.



(Left to right.) Mr. K. R. Mackley, Mr. N. Harrison, Mr. J. M Waldram, Mr. C. J. King, Mr. W. Robinson.

Another general point which received considerable attention was scouting and the split day. Night scouting, which involved the split day, is paid for at overtime rates and the general feeling was that night scouting should be done away

with altogether and that this work should be done during the day time, thus saving a considerable sum.

There was a challenge to the figure of 0.925d. per unit given in the paper. Sheffield claimed it was too high as the figure there was 0.75d.; Liverpool said a charge of 1d. per unit was being asked of them and that discussions had been going on with the Area Electricity Board on the matter, whilst Mr. NAYLOR, representing the British Electricity Authority, suggested that the author's figure was more like the pre-war one and that under present conditions the cost for electricity for street lighting should be in the neighbourhood of 1.3d. per unit.

For the lamp manufacturers, Mr. A. G. PENNY reminded the author that it was not the main purpose of lamps to last an indefinite period. The prime purpose of the makers was to increase the amount of light. If the amount of light emitted by a lamp was increased by 10 per cent., then the cost of street lighting was reduced by something of the order of 10 per cent. But if the life of the lamps was increased by 10 per cent., this merely reduced the cost of the lamp part of the installation by 10 per cent.; this was only about one quarter of the total cost so that the reduction in the total cost would only be of the order of 2 per cent. He suggested the author was going too fast in suggesting a life of 3,000 hours for lamps, although makers were constantly striving to increase the life of their lamps.

There was some conflict of opinion as to the period to be allowed between cleaning and lamp replacements, but the general answer by the author was that this must vary with different areas.

Specification or Code

On Tuesday afternoon, September 13, Mr. F. C. SMITH presented a paper entitled "Specification or Code."

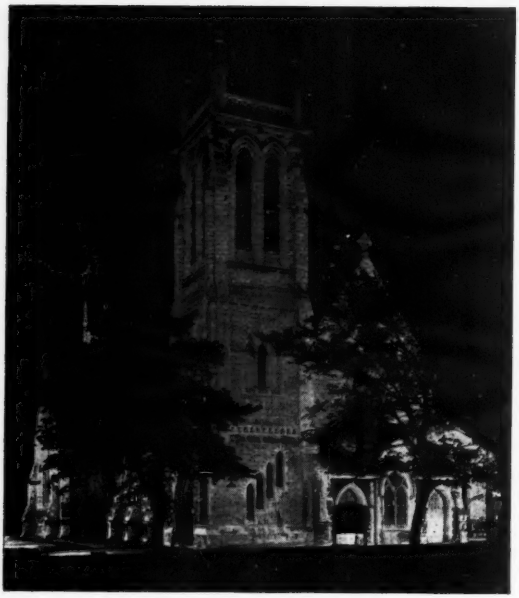
Mr. Smith has been closely identified for many years with the work done in regard to standardisation in street lighting and in his introduction pointed out that street lighting practice in the future will be influenced considerably by the specification or code of practice published to implement Clause 117 of the Ministry of Transport's Report. He explained that "a code of practice is a set of recommendations for guidance in design, operation and maintenance based on experience and practice, and prepared in such a manner as to convey to a knowledgeable user the general principles concerned." On the other

Mr. G. Grenfell Baines and Mr. E. B. Sawyer.

hand "a specification is a document dealing with things or requirements, item by item, with the precision necessary for the purpose, and states that the defined requirements *shall* be satisfied." Thus a specification was mandatory.

The brief interval between the publication of the M.O.T. Report, and the outbreak of war, together with the lighting restrictions imposed during the post-war period, has, he said, somewhat limited experience with installations designed to conform with the technical recommendations of the Report, but sufficient experience has been gained to form a reliable judgment of most aspects. It is believed that informed opinion agrees that the technical recommendations made in the M.O.T. Report are sound and will continue to be the basis, for a considerable time to come, of the general requirements for public lighting.

Mr. Smith continued that in the absence of either a specification or a code, the original Report has come to be regarded as a kind of working code. He believes, however, that either a satisfactory code or specification can be drafted within the framework of the Report, especially if the new document, in whichever form it may take, incorporates the experience gained with intermediate and cut-off distributions and takes account of the experience gained recently in the lighting of dual carriageways, roundabouts, etc., matters on which the committee frankly admitted insufficient experience at the time of the publication of the Report. He contended that the M.O.T. Report has



Holy Trinity Church, Llandudno, floodlit by No. 5 District Office of the Merseyside and North Wales Electricity Board using Phillips "Reigate" 140w. Sodium Floodlights.

Other Phillips sodium installations included the floodlighting of the Cenotaph, Town Hall, Public Library, St. John's Methodist Church, the North Western Hotel and St. George's Hotel (Conference Headquarters).

greatly influenced street lighting both from the technical, and, to some extent, the administrative standpoints, and that a specification or code drafted to implement this Report must take into account, within the general framework of the Report, the advancements that have been made since the date of publication. Further, he felt that any such document must have considerable influence on the street lighting of the future. The form of this document is therefore a matter of concern as a specification may influence street lighting in a more rigid manner than a code of practice.

The first specification for street lighting issued by the British Standards Association (No. 307) was published in 1927 and revised in 1931. The present intention is that this specification shall be superseded by a code of practice now in preparation. In the light of modern work and experience, and bearing in mind the requirements set out in the draft specification which was reviewed by Dr. Walsh at the Glasgow Conference in 1945, Mr. Smith thinks it is not unreasonable to suppose that in any future code or specification issued by the British Standards Institution more guidance will be given in respect of the following than was the case in the 1931 specification:

(1) The importance of, and the principles underlying, the siting of sources;

(2) The types of source distribution which are current or projected in the immediate future, the desirable correlation between each type and the recommended spacing.

It was very doubtful if any overall performance requirement will obtain sufficient general support to make it acceptable for inclusion for some years in any document whether it be specification or code.

In his conclusion, Mr. Smith said he has assumed throughout that the projected B.S.I. specification or code will implement the recommendations of the Departmental Committee on Street Lighting both in respect to design and maintenance. It would therefore appear that certain clauses in the new document must be of a mandatory character. It is, of course, the function of the drafting committee to set down allowable tolerances for such clauses. This is clearly essential on account of the widely differing character of streets and the large number of other variables which

are met with in street lighting problems. If the definition of a code as given in this paper is acceptable the presence of mandatory clauses in a code would not appear justified. It is acknowledged that the greater freedom permitted in a code has the advantage of making the document of considerable assistance to the knowledgeable user, imposing less restraint upon the designer and encouraging development based upon recognised good practice and within established principles. A code of practice has disadvantages, however, in so far as it is not in general acceptable as basis of contractual obligation, neither does it permit the purchaser to state requirements with the desirable precision.

From a consideration of both the objective and subjective factors contributing to the effectiveness of an installation, the difficulty of establishing a yardstick for the appraisal of installations is clear, especially as some factors influencing the final result are changing from time to time, whilst factors such as road reflection characteristics, etc., are not under the control of the lighting engineer. Studies of the conditions affecting the seeing qualities within installations are of the greatest value since general principles emerge from these which greatly assist the design. It is possible that after further work, certain measurements of physical quantities under the control of the engineer may be proposed which would be the basis of a "Go" or a "No go" criterion, but to date no proposal has received general acceptance.

The danger of such criteria becoming the "be all and end all" of design to the detriment of progress is freely acknowleged, and the emphasis placed upon test point illumination in B.S.S.307 is quoted as an example of the need for caution in proposing any such measurement.

Finally, whatever the ultimate document be called, it is possible, in Mr. Smith's opinion, for the draft now in preparation to be of real service but, in his view, it is desirable for it to combine, by the judicious use of the words "shall" and "should," the desirable features of both a code and specification.

In the discussion, MR. R. S. BRADLEY (Southern Electricity Board) emphasised the urgent need for a model form of contract for the supply and erection of street lighting installations and asked the Association to give immediate attention to it.

MR. E. STROUD supported the author's views and said that care should be taken that the new code was not too restrictive. It should give guidance on fundamental matters and should be reviewed every ten years, or at some reasonable interval. In considering this matter it was necessary to bear in mind the general practice; lighting authorities could not be told to scrap their existing installations and adopt this or that. It was essential to approach the problem in terms of economics. He urged the adoption of a spacing-height ratio of 4 to 1, but thought something closer was the ideal.

MR. J. W. JONES (North-Western Electricity Board) put the case for the small local authority through whose area main traffic routes ran and where a penny rate produced something like £9 per annum. Clearly these people could not meet the cost of the standard of lighting recommended in the M.O.T. Report.

MR. M. W. HIME (South-Eastern Electricity Board) bluntly asked when the code of specification was coming along. After many years of hard work it seemed to be no nearer than it ever was. At the same time he suggested that as there were various specifications for individual parts of street lighting installations, these might be elaborated and so make it possible to specify the ultimate results desired. By specifying the "bits and pieces," it was possible to arrive at a broad sort of code to give a guide which all could make use of. He asked the author to speed up things a little.

Mr. C. C. SMITH (Liverpool) challenged the author's statement that there was little or no experience of the lighting of dual carriageways in this country, and pointed to Liverpool, where such carriageways had, in his view, been lighted satisfactorily since 1924. He also thought a combination of code and specification was required.

The AUTHOR made a spirited reply to Mr. C. C. Smith and said he was unrepentant. He asked lighting engineers to go about the country and see if they could say that the lighting of dual carriageways could be regarded as satisfactory. In saying this, he did not criticise what Liverpool had done. On the question of a model form of contract he would not express any opinion but thought it would be a long while before the Standards Committee would be able to get down to it. He thought the financial hardship on small towns was an administrative matter which, however, would have to be dealt with. As to when the code or specification was to be issued, he said he hoped it would be soon, though there were so many people who had to be satisfied. There were the municipalities, the manufacturers, the lighting engineers, the electricity and gas

supply authorities and the Government Departments. He had hoped it would have been issued before the Conference, but when it was published he hoped it would command general respect.

In proposing a vote of thanks, the President remarked that Mr. Smith was always at his best when he had to fight, and he had shown that both in the paper and in the reply to the discussion.

Street Lighting Equipment.

Wednesday, September 14, was devoted to two papers—one in the morning and the other in the afternoon—describing the columns, lanterns, etc., which the manufacturers had exhibited.

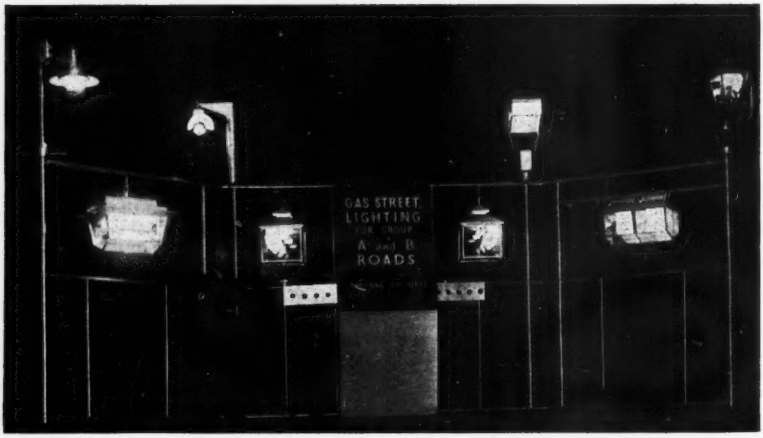
The morning paper was by Mr. J. A. PROWSE (British Electrical Development Association), who had been selected to present the electrical side, and the afternoon paper was by Mr. P. CRAWFORD SUGG, who had been selected by the manufacturers of the gas equipment to deal with their products. The exhibits are described elsewhere in this report.

At the close of the paper presented at the morning session, the President called upon M. Andre Boereboom, the first Chairman of the Belgian Public Lighting Commission, to address the Conference.

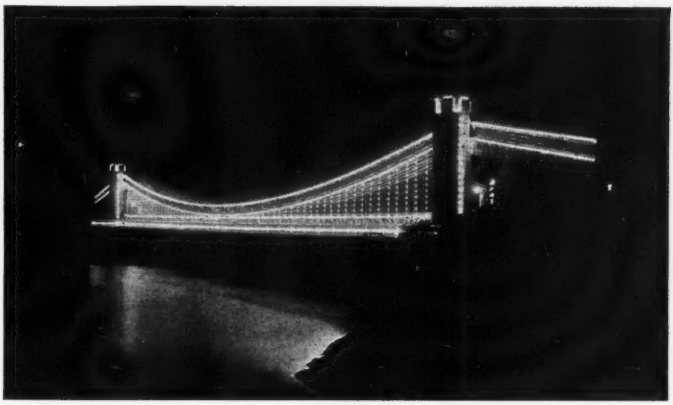
M. BOEREBOOM, after remarking that it was as the result of experience acquired at the Conferences of the Association that the Belgian Commission was formed and that an endeavour was being made to establish a Code of Practice there, said the problems in Belgium were very much the same as here, although there were some differences. Glare was a great problem, and the aim was to arrange the street lighting so that it would not be necessary for motorists to use their headlights. It was useless, however, he said, to prevent glare from motor-car headlights if there was glare from the street lighting, and it was the intention, therefore, to use cut-off lanterns as much as possible. Sodium lamps were used on the main arterial roads in Belgium, and there was also a tendency to use them on the boulevards and on the arterial roads which passed through small towns and villages, so that the form of the lighting would be a guide to the motorist in finding his way through the narrow streets of these places.

There had been many improvements in the street lighting of Belgium since the last war, and in such towns as Bruges, Brussels, Antwerp, and Liege the older equipment had been taken away and replaced chiefly with 80-watt mercury lamps or metal filament lamps. There was still a large amount of gas lighting in secondary streets, but it did not give the remarkable results that were obtained in this country.

Finally, he said they were very much interested in fluorescent lighting in Belgium, and the whole of the existing equipment in Charleroi was to be taken away and replaced by fluorescent lamps. There would be some 2,500 lanterns in the town, each containing four 40-watt lamps in the main streets and two 40-watt lamps in the other streets. The



Mr. Crawford Sugg presenting the latest information on gas street lighting equipment on behalf of the Society of British Gas Industries.



Not strictly part of the conference but Conway Suspension Bridge lighted by 2,000 15w. pearl lamps was admired by many of the delegates. This spectacular lighting was carried out by the Merseyside and North Wales Electricity Board in conjunction with B.T.H. lighting Engineers.

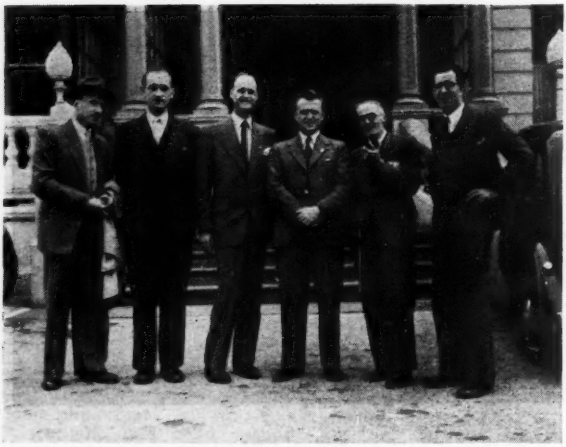
spacing was to be 120 ft. and the mounting height 25 ft. The lamps would be staggered, and instead of being in the horizontal position, as in this country, they would be at an angle of 20 deg. from the horizontal. He extended a welcome to anyone who could visit Belgium, and promised to show them what was being done there.

The Annual Luncheon

The annual luncheon of the Association was held at the Café Royal, Llandudno, on Wednesday, September 14, when the principal guest was Sir Harold Scott, K.C.B., K.B.E., Commissioner, Metropolitan Police.

Proposing the toast of "The Association of Public Lighting Engineers," Sir Harold Scott first congratulated the Association on its silver jubilee. He said he noted that the Conference began with a paper on economics and finished with one on aesthetics. He thought, however, that with the skill of the lighting engineer it could be hoped that in the future beauty and economy would be combined to give real utility in public lighting. After speaking of the large percentage of both fatal and non-fatal accidents which occurred on the roads at night, notwithstanding traffic was considerably less, he thanked the local authorities in London for the manner in which they had assisted the police in improving the lighting of the streets where the accident rate was unduly high, and said that the only way to make the streets as safe as they should be was by co-operation between the Association, the public lighting authorities, and the manufacturers. A great deal had already been done, but more remained to be done, especially from the point of view of the motorist, by siting the lamps in the right place. He also spoke of the manner in which the number of attacks on the fronts of business premises in London during the hours of darkness had diminished due to improved street lighting, and said he had no doubt that the same applied all over the country as well as to London. He also commented on the satisfaction that could be obtained from adequate public lighting in revealing the beauty of streets and buildings.

The PRESIDENT, in the course of his response to the toast, paid a tribute to the founders of the Association and welcomed three of them at the luncheon, viz., Mr. Wilkie, Mr. Shapley, and Mr. Davidson. Remarking that the Association had provided a platform where the gas and electrical interests could discuss their problems amicably, he said he hoped the two industries would continue to work as one happy family under nationalisation. That remained to be seen, but it would be regrettable if it were not so. He referred to the concern with which the members of the Association viewed road accidents which, apart from heavy loss of life and injury to persons, also involved a loss of something like £100,000,000 arising out of these accidents. No estimate was available as to the proportion of these accidents which was due to inadequate street lighting. Making one of the many subtle jokes with which he enlivened the proceedings throughout the Conference, the President said he hoped he would not be accused of speaking politically



(Left to Right) Mons. L. Gaymard of Paris, Mons. A. Boereboom of Brussels, Mr. E. B. Sawyer, Mr. N. Boydell (retiring President of the A.P.L.E.), Mr. C. R. Bicknell and Mr. G. F. Cole.

if he suggested that the slogan of the Association should be "The 'Light' Road for Britain." He added that the position calls for the closest co-operation between lighting authorities and the police. Public lighting had always had a hard struggle to get out of the shadow caused by the unfortunate designation, "The Cinderella of the public services," but the Association had done much to bring to the forefront what a vital service to the community was adequate street lighting. The restrictions on street lighting had now been removed, and it was to be hoped they would never again have to be imposed.

The toast of the "Urban District Council of Llandudno" was proposed by Mr. N. Boydell, the immediate past-president; the toast of "The Guests" was proposed by Mr. C. C. Smith (Liverpool), to which Dr. J. N. Aldington (president-elect, The Illuminating Engineering Society) responded.

Roads Abroad

On Thursday morning, September 15, an address was given by Mr. J. M. WALDRAM (president of the Illuminating Engineering Society) on "Roads Abroad and their Lighting" which was a literary as well as a descriptive treat. His quotation from Chesterton's poem, "The Rolling English Road," was indeed apposite and the description of the development of modern arterial roads from ancient tracks most entertaining.

Starting off with the remark that visitors from abroad have expressed admiration of our achievements in the art of street lighting and that, as a consequence, we might be tempted to suppose that we have little to learn, Mr. Waldram said it is only by comparison with roads abroad that we become aware of some of the characteristics of our own roads. The engineers and planners inevitably tended to produce a straight or smoothly curved road, suited for the traffic it must now carry, and entirely logical. Yet Chesterton was prepared to "bash" the foreigner who wanted "to straighten out the crooked road an English drunkard made," and, said Mr. Waldram, he thought he knew why. The very unexpectedness of the old road, sometimes irritating, had a curious charm and some real and technical advantages which were lost in the soulless regularity of the utterly tidy plan. These things could not be designed. They would not be found in the new towns, but enough of them remained to-day to set lighting engineers some special problems and add an interest to their job.

He spoke of the regularity of the planning of streets in American cities and said that the planners of the newer cities, like Cleveland and Detroit, planned them really generously to give room for motor traffic. But in planning for the automobile they had made the automobile indispensable, and so made their problem worse. Mr. Waldram said that a New Yorker had described New York to him as "a place of organised discomfort." Whilst the regularity of American streets was a great convenience to the newcomer he said that after a fortnight in New York he found it exasperating and monotonous. No street ever went anywhere. It was possible to go by a dozen different ways between two points—all exactly alike and of the same length. It was a working model of Gilbert's principle that "where everybody's somebodee, then no-one's anybody."

The width of the American streets

made it impossible to mount the "occasional central lanterns" which we recommended in this country as the street cars were in the way, and therefore it was necessary to throw light across the road from side-mounted lanterns. The centre of the roadway was therefore often dark, especially in wet weather, an effect enhanced by shiny tracks at the side. In any case a lay-out was imposed which was unsuited to producing "high and even road brightness" by the method we had developed here in 1933. Partly for this reason most American streets were not well lighted. However, some photographs were shown of some impressively lighted American streets such as Canal-street, New Orleans, the Erie Boulevard, Schenectady, and the Davidson Express Highway, Detroit. Mr. Waldram remarking that when the Americans decided to light a street well they did it very well indeed. For instance, in Canal-street, New Orleans, there are 95,000 lumens per 100 feet. There is very little gas street lighting in America though large supplies of natural gas are available.

Coming to some Dominion problems, it was pointed out that the lay-out of streets in South African and in Australian towns resembles British practice in the older parts of cities where the roads have "grown" in natural lines determined by features such as the waterfront or a hill. But in the newer cities, particularly in the flat country, development has resembled rather the American plan. A curious feature of main streets in Rhodesia derives from the days of Cecil Rhodes who designed them to be of such width that the 12-yoke ox-wagons could be turned round in them in one lock. Consequently quite small cities have a main road with a carriageway 80-100 ft. wide, but the full width is not now needed and a 30-40 ft. strip is metalled, sometimes at one side, the remainder being used for parking or occasionally for passing. This provided a complicated lighting problem which called for an elaborate installation which a small municipality could not afford.

A special problem in some South African towns, such as East London, is corrosion, which for some reason is exceptionally severe. Lanterns which are quite satisfactory in England fall to pieces in a matter of months; aluminium reflectors become matt and pitted rapidly. It is also necessary for enclosed lanterns to be completely insect-proof. Open lanterns are to be preferred.

Mr. Waldram then discussed the position in some Continental countries, and spoke of the almost lack of uniformity of street plan in Paris save for one thoroughfare running W.N.W. to E.S.E. and another shorter one from N.N.E. to S.S.W. The influence of the old fortifications and successive rings of boulevards was discussed, and, as regards France generally, it was pointed out that the Continental system of trunk roads was developed far earlier and more completely than ours. The Routes Nationales were characteristically different from our own, and the method of lighting these roads is deliberately different from our methods. The principal aim had been the suppression of glare, particularly in the country, and the system evolves from this. For arteries near the cities, and for Routes Nationales, a reflector cut-off system at a greater mounting height than is common in this country is used, and great attention is paid to the degree of cut-off. The tilting of

View of the lighting equipment on the promenade showing in the foreground columns exhibited by the Revo Electric Co. Ltd.

lanterns towards the centre of the road is a feature of French practice. The same aversion to glare is found in Italy.

Reference was also made to the unconventional experiments of the Germans for lighting their autobahn with complex and expensive projectors at 4 ft. height, but Mr. Waldram said he did not think they were pursued or that they worked very well. The German and Dutch trunk roads, other than autobahn, are lighted in places, usually by a cut-off system giving a glareless installation with moderate revealing power, sodium lamps being used. Various other features of Continental street lighting were mentioned, and Mr. Waldram concluded as follows:—

"This most marked difference between our approach to street lighting and the ideas on the Continent, especially in Holland and Germany, is their insistence on avoiding glare which led them to the cut-off system. We formerly used what would now be called a semi-cut-off system, but our first experiments with discharge lighting were with lamps which had to be burned vertically and which led us to a non-cut-off system. We found, much to our surprise, that it worked well and was suited, by its flexibility, to our winding and irregular traffic routes. We came to cut-off lighting later. The non-cut-off system has proved its capabilities as a utilitarian system suited to our roads, but now people are becoming more critical of its glare, often with reason. I think that we may perhaps effect some compromise by which we can retain the convenience, efficiency and flexibility of the non-cut-off system, and the comfort and elegance of the cut-off system—though it will probably have to be paid for by lanterns of higher precision, used in greater numbers and with higher powers. Or perhaps we shall find another solution in the large low-brightness lanterns for fluorescent lamps giving the flexibility of the non-cut-off system with appreciably less glare. But I think it will be necessary to improve on the system needing in each lantern three or four low-power lamps, each with a lot of heavy and expensive gear.

"We have many fields to conquer, in collaboration with the road makers and the lamp makers, and it will be interesting to see which way we shall go."

Before giving his lecture, Mr. Waldram brought greetings from the Illuminating Engineering Society and congratulations to the Association on its silver jubilee. He added that this was the first time a President of the Illuminating Engineering Society had been asked to address the Association, and for this he expressed his own and his Council's satisfaction, because the two bodies had a great deal in common.

Mr. Waldram was cordially thanked for his address.

Planning for a New Town

On Thursday afternoon, September 15, a paper on "Planning of Street Lighting for a Proposed New Town" was read by Mr. W. H. WELCH (Eastern Gas Board, Lighting Section, Tottenham Division).

The author had been provided by the Harlow Development Corporation with a copy of their master plan and, on the basis of this, attempted to build up what he considered to be an installation which would comply as far as possible with the recognised practices and principles of public lighting. Admittedly the scheme, which related to gas, was hypothetical and a great deal of generalisation was necessary as the author had not, at the time of preparing his paper, full details of the final lay-out. It was emphasised that the public lighting engineer should be early advised of the need for a new lighting scheme, and that he should get in early with a claim to provisional sites for proposed public lamps, thus leaving the way clear for a straightforward erection of columns as and when required.

The new town at Harlow has a designated area of 6,320 acres, being roughly 3¼ miles from north to south and 4½ miles from east to west. At the moment only two housing estates are being developed, but the author traced the development of the lighting scheme he would install were he called upon to do so, indicating the types of lamps he would use for particular locations and so on.

In the course of a short discussion there was a certain amount of hard hitting. Mr. F. C. ORCHARD (Eastern Electricity Board) said that gas lighting for a new town seemed to be a strange association, and Mr. GRENFELL BAINES, a town planner, did not spare the author when he severely criticised him for not bringing in a new technique for such modern towns instead of proceeding on the basis of current practice. It was also pointed out by Mr. E. C. CLAXTON (Stevenage New Town) that street lighting installations in these new towns should be such that they would not be out of date in 15 to 20 years.

Mr. F. C. SMITH stoutly supported the paper and maintained that in approaching such a problem there should be no prejudice in favour of either gas or

electricity, adding that because electricity was more modern it did not necessarily follow that it would provide the best job every time.

The AUTHOR, in the course of his reply, said that his paper had been "vetted" by the Harlow Development Corporation before it was printed.

The reception by the President and Mrs. Tapsfield was held in the Winter Garden in the evening.

Aesthetics

The final session of the Conference took place on Friday morning, September 16, when Mons. L. GAYMARD gave an address on "Public Lighting and Aesthetics," which was illustrated by a very interesting series of lantern slides.

M. Gaymard remarked that whilst it had been said at the luncheon by Sir Harold Scott that economy and aesthetics were, to a certain extent, opposites, he did not think that was necessarily the case. Indeed, he felt that the study of the aesthetics of street lighting should lead to economy, and that technical evolution and improvement naturally leads to the production of handsome work.

In the interests of aesthetics in relation to street lighting, he advocated (a) the banning of certain forms and shapes, useless embellishments and lines which are not harmonious, (b) the banning of certain glaring colours for columns, etc., (c) the banning of certain light colourings, the effect of which was unpleasant, (d) the banning of particularly offensive luminous signs, (e) restriction of the number of obstructions on public highways, and (f) the banning of overhead wires, etc., in residential areas.

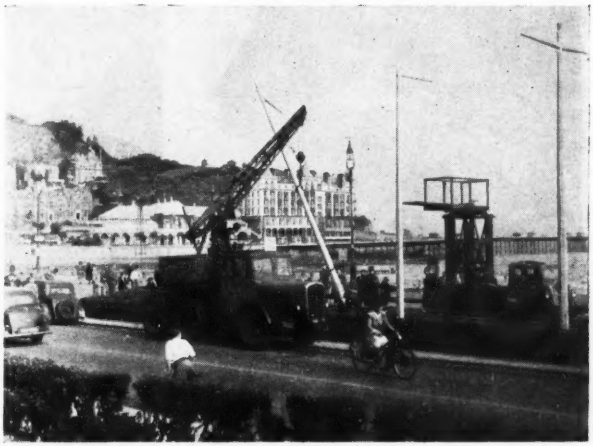
He emphasised that there is a day aesthetic problem and a night aesthetic problem which are not identical, and urged the need for the closest co-operation between architects, builders, lighting engineers and lighting authorities.

In support of his views he showed a large number of lantern slides depicting lamp columns and brackets and overhead wire systems in various parts of the world, which, he said, would be agreed were ugly and, as far as lamp columns and brackets were concerned, were extremely heavy in design. He also advocated the prohibition of sodium and mercury vapour lighting in certain places because of the effect on human faces and also on goods in shop windows. Similarly he would prohibit luminous signs in residential areas. Some particularly offensive examples of overhead line work were also shown.

He maintained that it is not necessary to abandon all ideas of standardisation in this matter, and suggested that lighting authorities, lighting engineers, architects, and Government departments throughout the world should get together and endeavour to lay down certain fundamental rules which would enable modern street lighting installations to be applied with due regard to the circumstances in particular cases.

The PRESIDENT, proposing a vote of thanks to M. Gaymard—which was given enthusiastically—said the members of the Association looked forward to him coming to future Conferences.

The Conference, which was highly successful throughout, was brought to a conclusion with votes of thanks to the chairman and members of the Llandudno Urban District Council, the manufacturers, and the staff of the Llandudno Urban District Council for all they had done to bring this about.

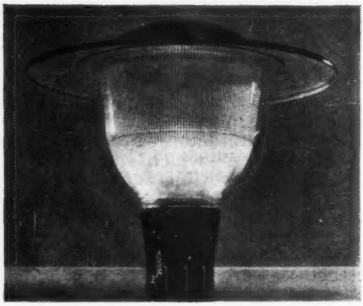


The end of the conference—dismantling the lighting columns on the promenade.

DEMONSTRATION OF STREET LIGHTING EQUIPMENT

During the period of the conference, delegates had an opportunity of inspecting an outdoor display of modern lamp columns and street lighting lanterns. These columns made an impressive display along the promenade. Unfortunately it was not possible for gas or electricity supplies to be laid on to the columns so that the lanterns could be seen illuminated. During the official inspection on the Monday a demonstration column erection was carried out.

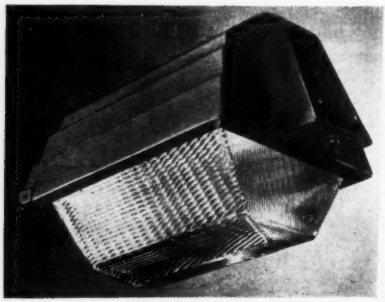
In the vicinity of the conference hall tower wagons and ladders were on show, whilst just outside the hall there was a display of traffic guard posts and traffic signs. There was also a comprehensive display of time switches and clock controllers.



'Holophane' pole top unit for class 'B' roads.

LANTERNS (ELECTRIC)

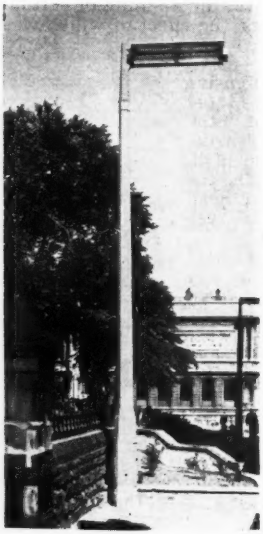
Holophane, Ltd. Recent Holophane developments have been mainly in connection with a new series of refractor bowls incorporating internal prisms giving the advantages of totally enclosed lantern construction with high performance and easy maintenance. New refractors on show included one for vertically burning 400-watt mercury lamps and a non cut-off bowl for sodium lamps. For Class "B" lighting two lanterns were shown; one an enclosed refractor bowl lantern for tungsten filament or mercury lamps, the other (illustrated on this page) an enclosed refractor lantern for column top spigot mounting.



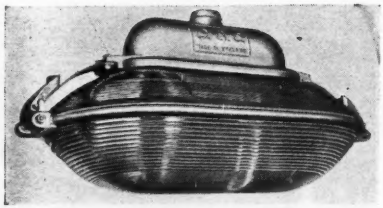
'Holophane' enclosed refractor lantern.

Revo Electric Co., Ltd. Revo street lighting fittings, which were displayed, were all of the latest design for use with mercury vapour discharge lamps, tubular fluorescent lamps, and tungsten filament lamps.

The "Silverblue" is for use with mercury vapour discharge lamps for Group



Revo 'Phidias' artificial stone standard with 'Sol-Etern' lantern.



G.E.C. Universal 'Dioptrion'

"A" lighting, and the special feature of this die-cast lantern is the independent control of light by a dual reflector system in conjunction with prismatic and plain glass panels. By this arrangement all available light is usefully controlled and glare is eliminated.

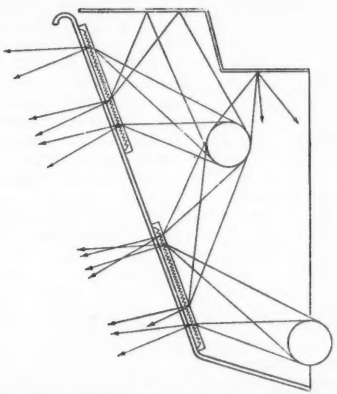
Revo "Sol-etern" Lantern is designed for two 5-ft. 80-watt lamps and will provide excellent visibility and a high degree of uniformity in road brightness when spaced and sited in accordance with the recommendation of the Ministry of Transport Final Report (1937 for Group "A" roads. Other lanterns for three or four 5-ft. 80-watt lamps are also available where higher standards of lighting are required, while for Group "B" roads smaller types are made for two 2-ft. 20-watt or two 2-ft. 40-watt lamps.

The C.10392, also on show, is a side entry die-cast lantern with copper canopy, clear outer glass and symmetrical or directional single-piece dome refractor for 500-watt tungsten filament lamps for Group "A" lighting.

Other lanterns for Group "B" lighting include C.12421, suitable for tungsten filament, mercury or fluorescent lamps, and C.12738/9, a totally enclosed lantern for sodium lamps.

The General Electric Co., Ltd. Ten lanterns, selected from types for H.P.M.V., sodium, fluorescent, and tungsten lamps, were shown. Among them was the new "Universal Dioptrion," a revised pattern of the "Dioptrion" lantern with arrangements for top or side entry mounting and a tapped magnetic deflector which enables either a 250-watt or 400-watt H.P.M.V. lamp to be used by making a simple adjustment to one connection. Two "Four-Eighty" lanterns for four 5-ft. 80-watt fluorescent lamps were shown, one vertical and the other horizontal. The vertical pattern is suitable for situations where a decorative design is desired, such as civic centres and parades, and emits a proportion of the light above the horizontal so that the façades of buildings are illuminated. The horizontal fluorescent lantern is used as a normal main road lantern.

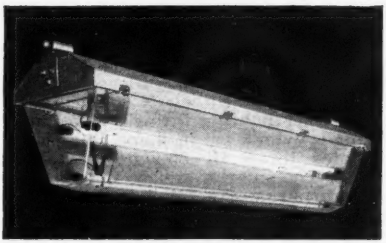
The other fluorescent lanterns displayed were for 2-ft. 20-watt or 40-watt lamps—a two-lamp horizontal pattern mainly for side streets, and a four-lamp vertical lantern. Sodium street lighting apparatus was represented by a totally enclosed lantern for 140-watt or 85-watt lamps. Three side-road lanterns were also on show.



Illustrating the optical system of the G.E.C. 'Three-Eighty' lantern.

Introduced for the first time at Llandudno, though not included in the display on the promenade, was a new three-lamp fluorescent lantern which embodies an optical system and form of construction that are new in lanterns of this type, the control of light from 5-ft. 80-watt fluorescent lamps being obtained by a refractor system instead of by metal reflectors.

The "trough" forming the lamp enclosure and the four refractor plates are made of "Perspex." Two refractor plates are cemented on the inner surface



G.E.C. 'Three-Eighty' fluorescent refractor lantern.

of each side wall of the trough by a process that makes an almost invisible joint. The lamps are arranged in a Vee formation, two at the top and one below, and the prism action in conjunction with direct vision of the lamps are the main factors in making the lantern appear uniformly bright when viewed from all angles up to about 80 deg. from the downward vertical.

The peak intensity is at about 75 deg. to the downward vertical and is well maintained up to 85 deg., while distribution around 45 deg. is helped by the reflection of all three lamps from the top reflectors. By the use of "Perspex" for the trough and prisms a great saving in weight has been achieved.

Metropolitan-Vickers Electrical Co., Ltd. The two principal exhibits from the Metrovick range of street lighting lanterns were the "S.O. Fifty" all-"Perspex" totally enclosed lantern for use with 85/140-watt sodium discharge lamps, and the "Trafford" bowl refractor lantern for use with 250/400-watt mercury discharge lamps burning horizontally. Both lanterns are designed for Group "A" roadways and are claimed to be the first of their types to be produced.

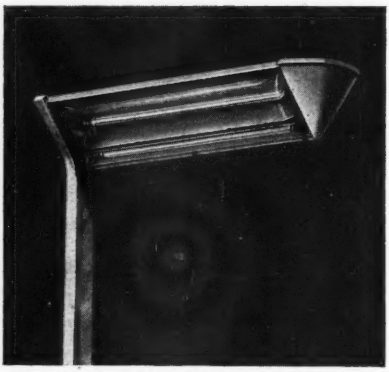
They are designed for side entry, clamping on to an unthreaded steel tube, which simplifies erection. "Perspex" is claimed to be unaffected by atmospheric conditions in coastal areas or by industrially polluted atmosphere. The canopy of the "Trafford" and the supporting casting in the "S.O. Fifty" are made from high silicon content aluminium alloy because of its excellent resistance to bad atmospheric conditions.

The use of "Perspex" in the "S.O. Fifty" has reduced the weight to half that of a similar lantern of metal construction and this simplifies erection and maintenance.

Considerable thought has been given to daytime appearance, and both lanterns have been passed by the Royal Fine Art Commission.

In addition to these lanterns Metrovick also showed an example of the open type (Poplar) sodium discharge lantern for Group "A" and "B" roadways and two lanterns for Group "B" roadways; the "Ryde" enclosed refractor lantern which uses either filament or mercury discharge lamps and a new two-lamp fitting using 2ft. 40-watt fluorescent tubular lamps.

Siemens Electric Lamps and Supplies, Ltd. The three lanterns demonstrated by Siemens were: The Wilton-Sieray lantern for three 80-watt fluorescent



The 'Wilton-Sieray' fluorescent lantern.

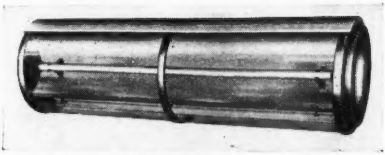
lamps; the Euston-Sieray for 250 or 400-watt mercury lamps burned horizontally; and the Wilton-Sieray for two-20 or two 40-watt fluorescent lamps. The first two lanterns are for class "A" roads, the last for class "B" roads.

The Wilton-Sieray 3-80 is the production version of the prototype lantern shown at last year's conference. The principal features of the lantern are (i) lightweight construction, (ii) easy access for cleaning and maintenance, (iii) easily removable control gear; and (iv) optimum optical light control by means of anodised aluminium reflectors. The lantern was displayed on a concrete utilities 3D column fitted with a special head, the whole forming a composite unit.

The Euston-Sieray 250/400 mercury lantern can be supplied fitted with a magnetic arc deflector in order to utilise standard MA/V discharge lamps. The body of light aluminium alloy is available for top or side mounting and the dish refractor gives non-axial asymmetic distribution.

The Wilton-Sieray 2-40 fluorescent lantern for side roads is a new addition to the Sieray lantern range. It is available for cradle or side entry mounting.

The Brighton Lighting and Electrical Engineering Co., Ltd.—Bleeco showed for the first time their No. 700 fluorescent street lighting fitting. This novel fitting is cylindrical in shape and accommodates three 5ft 80-watt fluorescent lamps. The interior reflectors are made of high purity aluminium anodised and polished and give a wide laterial spread of light over a large area. The main body is formed around a series of cast aluminium alloy circular discs, tied to-



'Bleeco' 3-80w. fluorescent lantern.

gether by three duralium tubes, which carry the reflectors and also give a seating for the top metal cap, end spinnings and flange to carry the "Perspex" cylindrical windows. The "Perspex" windows are made in one piece forming two-thirds of a cylinder, access to the interior being obtained by rotating them up into the top metal cap.

Another exhibit was the Bleeco "W" lantern, a totally enclosed reflector fitting with Philips 140-watt sodium lamps, employing a new form of light control for the downward light. This lantern is designed with special curved mirror reflectors to control the top light, but the bottom section of the lantern is formed as a "W" section, glazed with clear polished glass, the panes being placed at such an angle that the major part of the light which impinges upon them is reflected by "first surface reflection" to an angle from 70 deg. to 80 deg. from the downward vertical.

Examples of the Bleeco Streamline prismatic panel lanterns with Philips 140-watt sodium lamps were also shown.

Erected on a Tarslag Broadcrete column No. 441 was a "New Look" curved bracket called the Brighton "C." This bracket which is made with an involute curve is an endeavour to improve the general lines of the commonly used Swanneck type.

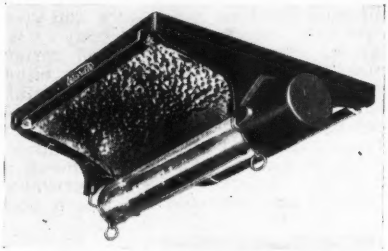
The Engineering and Lighting Equipment Co., Ltd., showed a number of fittings for class "A" and class "B" installations. These included their "Lancaster" lantern, for use with horizontal burning mercury lamps and giving a controlled cut-off light distribution. The "Golden Ray Mk. 11" lantern, also on show, is a development of an earlier series lantern designed for use with sodium lamps. The improvements made in the Mark 11 are the sealing of the external refractor prisms by clear window glass to ease maintenance, and the closing of the lantern by a hinged "Perspex" bottom door, making the fitting for all practical purposes dustproof.

A Mark 111 "Golden Ray" was also displayed. This lantern is totally enclosed by a single-piece "Perspex" bowl, and is for use with 45 or 60-watt sodium lamps.

For use with 80 and 125-watt MB/V mercury discharge lamps was the "Baldock" fitting, which consists of a single-piece body casting of aluminium alloy, with pre-determined focal positioning stops and a one-piece bowl refractor carried in a cast ring.

Falk, Stadelmann and Co., Ltd., showed two lanterns for group "A" lighting: (i) a side entry lantern for 85-140-watt sodium lamps, and (ii) their top entry "Hilux" lantern for 250-400-watt mercury lamps. Special attention has been given to the design of the former, in which advantage has been taken of the physical properties of "Perspex" to produce a "frameless" lantern, which, it is claimed, eliminates shadows thrown on the roadway by normal framed designs. A smaller version of this lantern, for use with 45-60-watt sodium lamps, is available for side-street lighting. Also for side-street lighting were the "Firefly" and "Dragon" lanterns, each being of cast aluminium alloy and using Holophane refractors.

The Wardle Engineering Co., Ltd. For group "A" roads Wardle showed their "Solux" prismatic refractor plate lantern and "Solux" directional silvered mirror-type lantern, both for use



The Wardle 'Solux' directional silvered mirror lantern.

with 85-140-watt sodium lamps. Also for group "A" lighting was their "Clifdon" bowl refractor lantern for 250-400-watt mercury lamps. For group "B" roads they showed the "Arran" lantern, which may be used with either tungsten filament or mercury lamps.

British Thomson-Houston Co., Ltd. For their part of the demonstration of street lighting equipment the B.T.H. Co., Ltd., made use of an interesting selection of their lanterns, mounted on

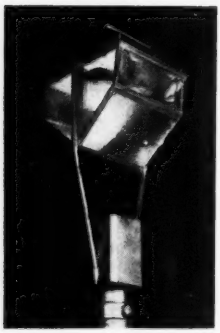
four different types of columns. The display showed some of the many Mazda lanterns which are available for a wide variety of street lighting needs, from main thoroughfares to residential areas.

Fluorescent lighting was represented by the Mazda Lanterns (SLB755 and SL750), whilst also shown were the Mazda Horizontal Enclosed Lanterns, for use with sodium and mercury lamps; the Mazda Stylised Lantern with Refractor Bowl (Cat. No.SL612), for use with mercury vapour lamps; the Mazda Urban Enclosed Lantern (Cat. No. SM278), for use with mercury lamps; and two types of Mazda Rural Enclosed Lanterns (Nos. SM302 and ST299, for use with mercury and tungsten lamps respectively.

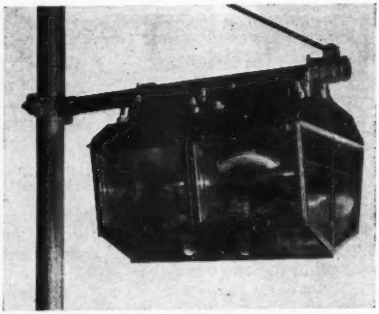
Other exhibitors of electric street lighting lanterns were the **Edison-Swan Electric Co., Ltd.**, who showed their "London Minor" for group "B" lighting, and **Thorn Electrical Industries,** who showed their PLQ/3080 fluorescent street lighting lantern.

Lanterns (Gas)

William Sugg and Co. Ltd. demonstrated a range of modern gas street lighting lanterns including for the first time the Group "B" "Southport" lantern which is uniform in style with the double-unit designed for group "A" lighting. The "Southport" lamp is of pleasing day-time appearance and gives excellent results. The group "B" lantern has a novel form of upright mounting which is suitable for either existing or for new columns. A feature of both lanterns are the specially designed Holophane refractor plates. They have oval prisms of graduated shape to give a wide lateral spread to the light distribution. The prismatic surfaces are protected by smooth glass covers to facilitate cleaning, and the burners may, if desired, incorporate the "Aeromatic" double injection principle which, it is claimed, completely eliminates the possibility of back-firing to the ejector.



Sugg's Group 'B' 'Southport' lantern.



Sugg's double unit 'Southport' 12lt No. 2 lamp.

Also shown were three varieties of the "8,000" lamp for side-street lighting.

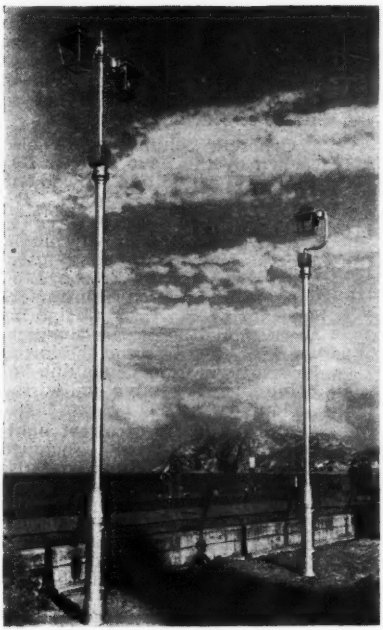
Parkinson and Cowan (Gas Meters) Ltd. showed their "Maxilla" and "Maxilla Junior" lanterns for group "B" lighting. One of the features of these lanterns is the complete interchangeability of standard parts, reducing stores and maintenance costs to a minimum, and rationalisation in design reducing the number of models available and at the same time providing for the incorporation of each unit in any single lighting installation.

Other gas street lighting lanterns were shown by **William Edgar and Son, Ltd.**, who displayed their "Eclipse" lamp with a new form of mounting, and **Willey and Co. Ltd.**, who showed their "Cranford" lamp.

Columns, Control Gear, Etc.

Several firms contributed to the display of lighting columns along the promenade at Llandudno. As the available poles had to be used to show the variety of street lighting lanterns which the manufacturers thereof wished to show to delegates it did not necessarily follow that lanterns and columns were correctly matched. Provided, however, that this was borne in mind the display was a very good one and the range of steel and concrete columns indicated quite clearly the progress in the field of lighting column design which has taken place during recent years.

Poles Ltd., manufacturers of "Adastra" steel lighting columns, showed two columns for 15-ft. mounting



Gas lanterns and brackets by Willey & Co.

height and a further six of 25-ft. mounting height for main-road lighting. All the columns were hot spelter galvanised after manufacture, this being the standard finish for "Adastra" columns. The durability ensured by the coating provides an extended life factor over any other practicable form of protection. Columns may be either circular or hexagonal in section.

Stewart and Lloyds, Ltd., showed 12 tubular steel columns suitable for mounting heights of 25 ft., 15 ft., and 13 ft. The columns are designed to give adequate strength and reliability and are of slender and pleasing appearance, having been approved by the Royal Fine Art Commission. Special attention has been given to the design of the base to cause the minimum of obstruction on footpaths.

The Stanton Ironworks Co. Ltd. showed 12 of their spun concrete columns. The designs of six of these have been passed by the Royal Fine Art Commission. The latest type, 6G, embodies armoured glass panels in the doors which allow of the illumination and incorporation of the coat-of-arms of the local authority in the base of the column.

Concrete Utilities Ltd. showed a range of columns for all types of exterior illumination. All columns using overhang brackets employ a patented method of securing bracket arms to shafts.

Some of the columns on show were made incorporating the prestressed method of tensioning the reinforcement. When the high tensile steel is placed in position it is held in tension whilst the mould is filled so that when the concrete sets and the tension is released the concrete generally is under compression. It is understood that further work is being done on this subject.

Tarslag Ltd. exhibited "Broadcrete" columns for both main-road and side-road lighting. Both columns and brackets are ground on all faces to ensure perfect lines. They are then finished to give either a uniform light-grey appearance and even surface or a smooth ground semi-polished finish in which the natural colour of the aggregate is exposed.

Spun Concrete Ltd. showed concrete columns for mounting heights of 15 and 25 ft. Special attention has been given in these columns to the provision of a

Concrete poles shown by Poles, Ltd.

The Bedford tower waggon.

waterproof base chamber, access to which is by means of a heavy concrete or cast aluminium door fitted with a tamper-proof locking device.

Costain Concrete Co. Ltd. showed a number of prestressed lighting columns. The intention of prestressing is that when subjected to bending well over working loads no portion of the concrete normally subjected to bending is in a state of tension so that the column is not so liable to cracking.

Concrete columns were also shown by the **Revo Electric Co., Ltd.**, who in addition showed one steel standard for group "B" lighting.

The demonstration of column erection on the Monday afternoon was given by Erecon, Ltd., who are erection contractors specialising in street lighting work, undertaking the complete work of erection from the initial excavations and installing of columns to the fixing and wiring of lanterns, etc.

Manufacturers of **street lighting control gear** included Sangamo Weston, Ltd., who also showed portable photometers; Metropolitan Gas Meters, Ltd.; the Hortsmann Gear Co., Ltd., the Automatic Telephone and Electric Co., Ltd., who are concerned with ripple control; and Aspec (London), Ltd.

Ladders and tower waggons were shown by the Ford Motor Co. Ltd., Shaftesbury Ladders Ltd., and Vauxhall Motors Ltd.

The display of bollards, illuminated guard posts, and traffic signs was by Gowshall Ltd.

Personal Notes

Holophane, Ltd., announce the appointment to their board of COMTE EXELMANS, president and director-general of Société Anonyme Holophane of Paris. Mr. W. T. F. SOUTER, general sales manager of the company, is also appointed to the board of directors. Dr. S. ENGLISH, technical director of Holophane, Ltd., has been appointed joint managing director.

Mr. L. C. JESTY, formerly with Cinema-Television Ltd., has now joined the laboratories of Marconi's Wireless Telegraph Co., Ltd., where he will continue with research work on television.

Mr. T. F. PETER BELL, since 1945 chief designer to Thorn Electrical Industries, Ltd., has now set up on his own account as an industrial designer, specialising in electrical and engineering products. His services are being retained by Thorn Electrical on lighting fittings design.

Mr. R. O. ACKERLEY retired from his position as manager of the illuminating engineering department of the G.E.C. on September 30. Educated at Eton, Mr. Ackerley joined the G.E.C. in 1919, and for five years represented the company in South Africa. A past-president of the I.E.S. and chairman of the Utilisation section of the I.E.E., he is probably one of the most prominent figures in the lighting industry. We and his many other friends wish him a long and happy retirement.

Appointed as chief illuminating engineer of the G.E.C. is Mr. S. ANDERSON. Educated at Bedford School and Faraday House, Mr. Anderson had experience of the electric supply industry and joined the lighting industry in 1929 as a member of the staff of the E.L.M.A. Lighting Service Bureau. He joined the G.E.C. in 1935.

It is announced that Mr. K. R. HOPKIRK, chief mechanical engineer of the B.T.H. Co., has been elected a director of that company.

Problems in Illuminating Engineering For Students

By S. S. BEGGS, M.A., F.I.E.S.

2. *Fundamental Relationships and Calculations*

The examiner in the Final Grade C. and G. examination is permitted to include questions on the subject matter of the Intermediate Grade syllabus; however, such questions are not likely to ask merely for basic formulae but rather for their application to specific problems in such a way as to test the candidates' understanding of the nature of the quantities and relationships involved.

The fundamental relationships which underlie all lighting calculations may be summarised as:—

(1) Light flux (lumens) = Intensity (candles) × Solid angle (steradians).

(2) Light flux (lumens)=Illumination (lumens/sq. ft.) × Area (sq. ft.).

(3) Intensity (candles) = Brightness (candles/unit area) × Area (units of area).

The well-known Inverse Square Law and Cosine Law are really derived laws, applicable strictly only to the point source or parallel rays, but nevertheless often of great value to the degree of accuracy required in practice. Their combination in the Cosine Cubed Law for the illumination on a plane is specially useful as the working area so often is a plane which may be horizontal, vertical or inclined.

The definitions of technical terms such as transmission factor, luminous efficiency, or coefficient of utilisation must, of course, be known or they are likely to be misapplied and their values miscalculated.

Standard forms of diagrams, such as the illumination curve of a symmetric unit or the isocandle diagram of the asymmetric, and their use in calculations, must be known.

Calculations can usually be completed in a much shorter time than a descriptive answer requiring the same amount of knowledge, which is a considerable advantage; in most calculation questions in this grade, however, some further information, such as the theory involved or a practical design related to the calculation, is also required.

The first article in this series appeared in Vol. XLII, No. 9, September, 1949.

Question 1 (1946).

A small light source emitting 1,260 *lumens and having a uniform intensity in all directions is enclosed in an opal sphere. If the overall efficiency of the sphere is* 81 *per cent., what is the illumination produced on a wall* 10 *ft. from the fitting? If now a small hole is made in the side of the sphere of such a size that the whole light source can just be seen through it, what is the new illumination on the wall in the direction of the hole?*

If the transmission factor of the glass in sheet form is 37 *per cent., what is its absorption factor?*

Answer.

(i) ILLUMINATION ON THE WALL.

Since the overall efficiency of the sphere is 81 per cent., light flux emitted

$$=1{,}260 \times \frac{81}{100} \text{ lumens.}$$

Since the source and the opal sphere are both uniform, this light will be distributed symmetrically in space.

$\therefore$ intensity of spherical globe=

$$1{,}260 \times \frac{81}{100} \times \frac{1}{4\pi} \text{ candles.}$$

Such a sphere of uniform brightness behaves as a point source of the same intensity placed at its centre (whatever

the ratio of diameter of sphere to distance to point of measurement).

Hence (maximum) illumination on a wall at 10 ft. distance

$$=1{,}260 \times \frac{81}{100} \times \frac{1}{4\pi} \times \frac{1}{10^2}$$

$$=0.81 \text{ lm./sq. ft.}$$

The small hole will allow a certain amount of light flux to escape directly in the narrow cone centred on the direction of the hole; the maximum intensity of this small beam will be equal to that of the source.

The remaining diffused light flux will be reduced so that the intensity of the opal globe (excluding any light directly emergent through the hole) will be slightly less than the figure just calculated. The amount of this reduction is the ratio of the area of the hole to the total area of the surface of the opal sphere, and as the hole is stated to be small, this may here be regarded as negligible.

The intensity of the uniform source is $1{,}260/4\pi$ candles. Hence, assuming the hole is directly in line with the nearest point of the wall (which the question appears to intend),

maximum illumination on the wall =

$$\left[\frac{1{,}260}{4\pi} \times \frac{1}{10^2}\right] + 0.81$$

$$=1.81 \text{ lm./sq. ft.}$$

(ii) Absorption Factor of Opal Glass.

Suppose the reflection, transmission and absorption factors of the opal glass of which the sphere is made to be R, T and A respectively.

Then $R+T+A=1$.

Now, by considering the light incident on the inner surface of the sphere directly and after one, two, three, etc., reflections, the total light, f, emitted from the sphere is easily shown to be given by:—

$$f = (F \times T) + (R \times F)(T) + (R^2 \times F)(T) + (R^3 \times F)(T) + \ldots\ldots\ldots\ldots$$
$$= (F \times T)(1 + R + R^2 + R^3 + \ldots\ldots\ldots\ldots)$$
$$= \frac{F \times T}{1-R}$$

where F is the light output of the source placed inside the sphere.

Thus $$\frac{f}{F} = \frac{T}{1-R} = \frac{T}{T+A}$$

In this case we are given

$$T=0.37 \text{ and } f/F=0.81.$$

$$\therefore\ 0.81 = \frac{0.37}{0.37+A}$$

and $$A=0.37\left[\frac{1}{0.81} - 1\right]$$

$$=\frac{0.37 \times 0.19}{0.81}$$

$$=.087$$

The absorption factor of the opal glass is therefore 8.7 per cent.

Question 2 (1948).

In a railway marshalling yard it is required to light uniformly a circular area 20 ft. in diameter from a single small fitting 10 ft. above it; the illumination required is 2 lumens per sq. ft. Calculate the light distribution required from the fitting and estimate the power of the lamp needed. Suggest a suitable optical system for such a fitting.

Answer.

Since the desired illumination at any point is 2 lm./sq. ft., with a mounting height of 10 ft., if I is the intensity in candles required in a direction making an angle of A deg. with the downward vertical, by inverse application of the Cosine Cubed Law for illumination on the horizontal plane

$$I = \frac{2 \times 10^2}{\cos^3 A}$$

The required distribution may therefore be obtained as follows:—

Angle A (degrees)..	0	15	30	45
Cos A.....	1.0	0.966	0.866	0.707
$\cos^3$ A	1.0	0.901	0.649	0.354
Intensity I (candles)	200	222	308	566

No light is required at angles greater than 45 deg. to the vertical, so the light distribution can have a sharp cut-off at this angle.

The total light falling on the illuminated area is given by

F=average illumination × area

$=2 \times (\pi \times 10^2)$

$=200\pi$ lumens.

Since this is the light output from the

fitting, the light output from the source that must be used is given by the quotient of this value by the light output ratio of the fitting, which is likely to be of the order of 70 per cent. A source of approximately 900 lumens output is therefore required. A tungsten filament lamp of 75 watts rating would probably be most suitable for the purpose.

Since a relatively deep cut-off is required, a domed reflector is the obvious selection. As the distribution demands good control of the light, vitreous enamel is unsuitable, and a good specular material, such as well-protected silvered glass or anodised aluminium, should be used. The contour of the reflector would be such as to redirect light leaving the lamp at high angles into a nearly vertical direction, while light emitted from the lamp at lower angles would be reflected at wider angles to the vertical. Rays falling on the reflector near its lower edge would be reflected at angles of approximately 45 deg. This form of reflecting system provides the greatest degree of control of the light with the minimum size of reflector.

City and Guilds Examinations in Illuminating Engineering

Results of 1949 examinations

The results of the City and Guilds of London Institute examinations in illuminating engineering, which were held last May, have just been announced, and are given below:—

INTERMEDIATE GRADE

LONDON:
First Class.—Bessant, J. W.; Chambers, G. E.; Cooper, E. F.; Crow, F. H.; Dyer, E. C.; Greenhalgh, D. E.; Hill, L. C.; Hacker, K. D.; Harper, T. S.; Hayward, M. F.; Haywood, K.; Inch, C. T.; Jackson, M. G. A.; Letchford, L. G.; Mayo, F. J.; Musset, A. E.; Pullin, W. M.; Scarr, J. R.; Taylor, E. P. *Second Class.*—Carr, D. L.; Dawes, S. M.; de Lasa Sharpin, G. M.; Dines, R. W. D.; Double, E. F.; Harris, P. H.; Jeffery, S. N.; McGarry, D. W.; Mainwaring, G.; Mara, E. J.; Mendham, J. E. W.; Pluck, N. S.; Taylor, J. H. R.; Thomas, P. A. T.

BIRMINGHAM:
First Class.—Newbery, D. F. J.; Rose, J.; Schramm, C. L.

SHEFFIELD:
First Class.—Marshall, K. *Second Class.*—Woodhouse, J.

GLASGOW:
First Class.—Frame, A. A. G.

CARDIFF:
Second Class.—Cooper, W. A.; Houston, N. D.; MacCarthy, B. J.; Turner, H. A.

MANCHESTER:
First Class.—Holdsworth, G. A.; Jackson, G. S.; Merritt, P. G.; Peel, A. B.

RUGBY:
First Class.—Bellchambers, H. E.; Lambert, G. K.; Mills, R. V.; Phillips, C. McN.; Phillipson, S. A.; Privett, H. L. *Second Class.*—Needham, L. F.; Walker, C. H.

LEEDS:
First Class.—Sessions, H.; Temple, A. R. *Second Class.*—Hobbs, P. J.; Milner, E.

OTHER CENTRES:
First Class.—Slater, H. J. *Second Class.*—Beard, D. E.; Cowling, F. B.

FINAL GRADE

SECTION "A"

LONDON:
Second Class.—Slinn, L. R.; Sunderland, D. T.; Wray, B.

GLASGOW:
First Class.—Donnachie, H.; Hume, H. M.; Shearer, R.; McDonald Stewart, W. H.; Stuart, C.; Thomson, J.; Whiteford, J. *Second Class.*—Allan, J.; Gavine, R. J. W.; Hunt, J. W. A.; Jones, B.; Knight, I. D.; McFarlane, J.; Colvin, D. R.

BRISTOL:
First Class.—Hazell, R. S.

LIVERPOOL:
Second Class.—Horner, C. J. N.

SHEFFIELD:
First Class.—Staniforth, N. L.

SECTION "B"

LONDON:
First Class.—Figgis, P. D.; Roberts, T., Slinn, L. R.; Wray, B. *Second Class.*—Bell, M.; Heald, I. M.; Nash, A. H.; Ormerod, R. W. W.; Palmer, R. C. C.; Smith, V. J.; White, L. D.; Harrison-Jones, E. R.; Jones, G. C.; Moody, A. H.; Pickering, T. E.; Prickett, J.; Sunderland, D. T.

GLASGOW:
First Class.—McDonald Stewart, W. H. *Second Class.*—Colvin, D. R.; Donnachie, H.; McFarlane, J.; McMillan, W.; Rodford, E. T.; Stuart, C.; Thomson, J.

BRISTOL:
First Class.—Hazell, R. S.

SHEFFIELD:
First Class.—Staniforth, N. L.

HULL:
First Class.—Styles, C. B.

Fluorescent Street Lighting

Some interesting public reactions

Following the installation of Mazda fluorescent lighting in Powis and Hare Streets, Woolwich, certain unofficial—but none-the-less telling—inquiries have been made amongst members of the public in the area.

These inquiries had the object of determining the reaction to this form of street lighting amongst people who, disregarding all technical considerations, were able to speak from their own experience. Certain distinct groups were approached individually, and their observations, as recorded below, make interesting reading.

Bus Drivers

A total of 25 drivers on L.T.E. Routes 75 and 53 were approached. Both of these routes cover the whole length of Powis-street, and the drivers were unanimous in their opinion that the lighting in this street is better than any other which they had encountered in either dry or wet conditions. They commented that they had found:—

(a) No top glare.
(b) No shadows.
(c) Continuity of light intensity, with marked reduction in driving strain and considerable lessening of accident risk.

Police

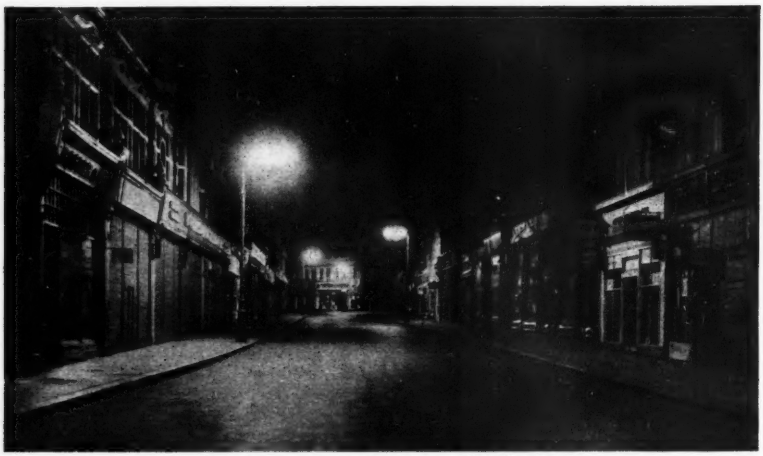
Officers whose area of duty includes Powis-street and Hare-street confirmed the view of the bus drivers with regard to safety.

It was also observed that their work in combating lawbreaking had been greatly facilitated due to the absence of shadows, cases of attempted breaking and entering of premises, loitering and other nuisances showing a marked decrease since the installation of the fluorescent lighting.

Tradesmen

Opinions were sought from shopkeepers and store managers in widely differing classes of business, and all of whom approved of the new lighting. Some idea of the range of trades covered may be gained from the following notes:—

1. Foodstuffs. — Managers of a butcher's shop and a multiple grocery both thoroughly approved. The type of lamp used ("warm-white") had no im-



Fluorescent street lighting at Woolwich.

pairing effect on the natural colour of the goods displayed in their windows.

2. Clothing.—Managers of a hatter's and a multiple tailor's and the manageress of a gown shop all agreed that this lighting was the best they had seen. In the gown shop it was found that the lighting in the street blended excellently with existing tungsten window lighting to enhance the colours of the gowns displayed. A similar comment was made at the multiple tailor's, with the additional remark that they had derived great benefit from the street lighting during the restrictions on window lights.

3. Cycle Accessories. — Again, the point was made that besides being, in the manager's opinion, first-class street lighting, the installation made his window display completely visible at night with excellent effect—a happy circumstance in view of the fact that no window lighting is installed.

4. Department Store.—Window displays here are changed frequently, with a wide range of goods to be shown, varying from fresh fruit to textiles, for instance. As in the case of the gown shop, the fluorescent light from the street fittings combined to advantage with the tungsten window lighting, giving excellent colour rendering to all classes of merchandise.

Ratepayers

Citizens of the Borough of Woolwich who were asked for comments from the ratepayers' point of view were generally of the opinion that this lighting was a first-class improvement to the borough and that it was money well spent. A large percentage added that they would like to see the remainder of their main roads illuminated in similar fashion.

General Conclusion

These investigations, whilst on a comparatively small scale, were carried out with a conscientious desire to obtain genuine "cross-section" results. The practically unanimous enthusiasm which is shown speaks well for this form of street lighting, for the BTH lighting engineers who planned the installation and for the equipment used.

Illuminated Guardposts in the City of Westminster

Control of gas illuminated posts

During 1946 the City of Westminster decided to replace the old existing bollards on refuges and islands within the city by self-illuminated guardposts of a pattern to comply in all respects with the latest Ministry of Transport Regulations. The number of bollards to be replaced by illuminated guardposts was 1,200, approximately half of which would be illuminated by gas and half by electricity.

Before the Ministry gave approval to the new illuminated guardposts, surface brightness tests covering the area of the illuminated panels were undertaken by the then Gas Light and Coke Company on behalf of the Ministry, and the then Central London Electricity Supply Company. The tests were carried out both in the laboratory and on site in main roads.

The interesting feature of the gas illuminated guardposts is the use of a special device manufactured by Messrs. Wm. Sugg and Co., Ltd., known as the Central Control System which provides for any number of a "group" of illuminated guardposts, together with the centre island refuge lamp where fitted, to be simultaneously lighted and extinguished by one clock controller. By reference to the illustration, which shows an illuminated guardpost containing the main controls, the following notes will make the operation of this control system quite clear.

The control system shown in the photograph incorporates a Horstmann 3A/UNI Clock Controller with a special cock (marked B) and "Comet" igniter (marked D). Each of the other units of a "group" is fitted with similar controls but without the clock controller, the gas supply to each burner

being taken independently from the gas main, so that the gas passes through an isolating cock and a "C.C.S." valve (marked E) before reaching the burner.

A connection to a "Comet" hot catalytic igniter is taken off the main burner supply in each case just above the "C.C.S." valve.

In the "lamps out" position the clock controller allows gas to pass and thus maintains pressure in the small tube (marked C) which has a branch leading to the "C.C.S." valve of each unit. The branch is not visible in the photograph

Gas illuminated guard-post showing controls.

since it runs down behind the clock controller and the lower reflector (marked A).

In the "lamps alight" position no gas is passed to the small tube, and the pressure in this tube is reduced to zero through a vent in the cock of the controller.

The "C.C.S." valve is diaphragm operated with inlet pressure applied beneath the diaphragm, while the pressure in the small tube C is applied above the diaphragm. When the pressure on both sides of the diaphragm is balanced the diaphragm, which is weighted with a small valve, drops by gravity and closes off the supply to the burner. When the pressure in tube C (and, therefore, above the diaphragm) is released the diaphragm and valve lift by the influence of the inlet gas pressure and open the gas supply to the burner. As tube C connects all "C.C.S." valves, the burners in separate lamps and guardposts light up or extinguish simultaneously.

A testing cock to release the pressure above the diaphragm of each "C.C.S." valve is fitted in tube C just above each valve, for the purpose of testing individual burners. A similar cock fitted in the main branch of tube C immediately above the clock controller enables all burners to be tested without interfering with the controller and is also used for fog lighting.

A notable feature of this system is that in the event of any unit of a "group" being damaged sufficiently to fracture the easily broken tube C, thus releasing the pressure in this tube, it will result in the immediate lighting of the remaining units of the "group," or if these are in lighting at the time they will remain alight until turned off by hand. It will be obvious that this provides a considerable measure of safety should any unit on a refuge or island be knocked down.

E.L.M.A Design Courses in London

As the Lighting Service Bureau were unable to find space for the great number who applied for seats for the current illumination design course they have decided to run a "repeat performance" starting on Monday, November 14.

Whilst apologising to those who were disappointed in not getting vacancies on the present course, the Bureau point out that requests for seats must be made as early as possible, and in any case in good time to allow the Bureau to notify applicants of the success or otherwise of their application well before the opening meeting of the series. In the case of the new series announced above, the final date for receiving applications is Thursday, November 10.

Colour Group Meeting

At the meeting of the Colour Group, to be held at 5.30 p.m. on November 2 at the Institute of Ophthalmology, Judd-street, W.C.1, Dr. A. A. Kruithof, of Philips, Eindhoven, will lecture on Chromatic Adaptation.

The Metrovick "SO FIFTY" Lantern

Some Notes on Manufacture and Performance

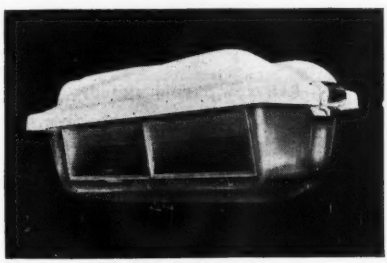
By A. MITCHELL and E. G. WOTTON, B.Sc. *(Eng.)*.

The Metrovick "SO Fifty" Lantern is, we believe, the first model ever produced of a totally enclosed refractor street-lighting lantern built almost completely of "Perspex" acrylic resin. The unit, which accommodates either an 85-watt or a 140-watt sodium discharge lamp, is to a modern design which has been passed by the Royal Fine Art Commission. It was first introduced at the I.E.S. Summer Meeting last year.

General Description

The lantern consists of an upper part or hood and a lower hinged enclosing bowl. The hood, which is shaped from 3-16-in. thick dense opal "Perspex," is supported by a two-part rib in cast Alpax (high silicon content aluminium alloy) which also carries the lampholder and lamp support assemblies. The bracket arm of the lighting column slides into the cast rib, where it is fastened by set-screws. Hinged from the rib by a stainless steel wire ring is a bowl shaped from 3-16-in. thick clear "Perspex," to the sides of which specially designed refractor plates of clear "Perspex" are sealed. The lantern is closed by a stainless steel toggle; when closed it is weatherproof. All the metals used offer high resistance to atmospheric corrosion.

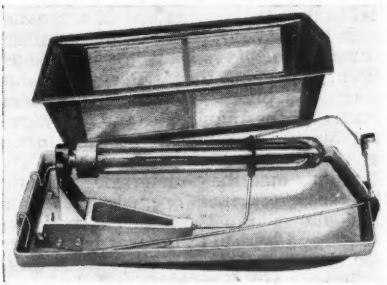
The component parts of the lantern are clearly seen in the illustration. The low weight of 16 lb. is at the most half the weight of a comparable lantern manufactured from conventional materials. It will be clear that this saving in weight is of great assistance in handling and erecting the lantern.



The 'SO Fifty' lantern.

Choice of Material

The material used in the manufacture of the "SO Fifty" lantern is polymerised methyl methacrylate, made by Imperial



Interior view of lantern.

Chemical Industries, Limited, and better known as "Perspex." The qualities that make this material attractive for use in lighting fittings are:—

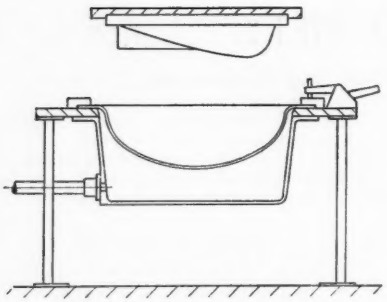
Remarkably high shock resistance.
Freedom from splintering.
Chemical stability in relation to all corrosive atmospheres normally encountered.
Relative ease of manipulation.

Manipulation of "Perspex"

In shaping the hood the "snap back" method is used, in which the material is manipulated in the following manner.

The sheet is cut to the required size, the masking paper removed, and the sheet washed in warm soapy water to remove any gum that may be left behind by the paper. It is then heated to a temperature above its softening point; it is important that the oven shall have an even temperature distribution, since uneven heating of the "Perspex" may give rise to uneven stretching of the material, and therefore to irregular stressing and the possibility of mechanical instability.

The softened material is quickly



Diagrammatic sketch of mould.

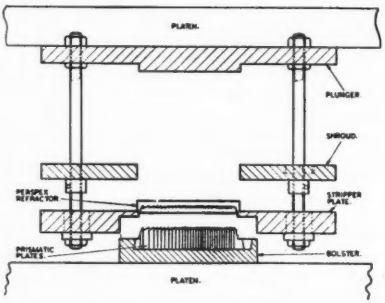
clamped over the open end of a vacuum tank, from which the air is then pumped, causing the "Perspex" to be sucked down. When the "Perspex" has assumed a plain bowl shape, a wooden former of the required shape is lowered and quickly clamped in position in the tank above the dished "Perspex." The vacuum on the underside of the "Perspex" is then opened to the air; this allows the "Perspex" to "snap back" and cool on to the wooden former. For simple shapes this in itself is quite sufficient, but for complicated shapes, and shapes such as the hood of the lantern, where mouldings of close tolerance with small radii are required, it is necessary to assist the "snap back" process by raising the pressure in the tank above atmospheric.

In shaping the bowl of the lantern the same procedure is adopted, using, of course, the appropriate shape of wooden former. In this case the tool has been so treated as to impart to the clear "Perspex" bowl a dimpled surface which is quite novel in the field of "Perspex" finishing. Whilst this finish has, in itself, a very pleasing appearance, its main purpose is to diffuse the direct light from the burning lamp; apart from these considerations, the introduction of this finish carries with it a considerable simplification in tool manufacture, with a corresponding saving in cost.

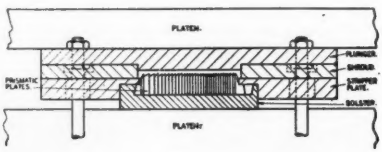
The "Perspex" refractor plates for the "SO Fifty" lantern are produced by the "shock moulding" process, which consists of heating the "Perspex" sheet until soft, placing in a mould, and closing the mould quickly, thus deforming the material to the required shape.

The plate is left in the mould until it is cool enough to be removed without distortion. The temperatures of the hot "Perspex" and the warm mould have been selected after considerable experiment so as to link the heating time of the "Perspex" and the cooling time in the mould in a conveniently short production cycle which involves no external heating or cooling of the mould once the cycle has been initiated.

The mould consists of a series of accurately ground and polished prismatic steel plates which are fastened side by side in a bolster, a stripper plate which removes the "Perspex" from the prisms after moulding, a shroud which houses the "Perspex," and a plunger which applies the positive pressure required. When the press is opened, the plunger rises clear of the mould, followed by the shroud, and finally the stripper plate lifts the "Perspex" clear



Refractor mould open.



Refractor mould closed.

of the prisms. The process is illustrated in the sketch below.

The optical accuracy of the moulded plates naturally depends on the accuracy of the cutting and polishing of the mould. Given a suitable tool, the manufacture of the refractor plates is very much simpler than that of glass prisms,

and the present lantern demonstrates most effectively the adequate performance of this new type of plate.

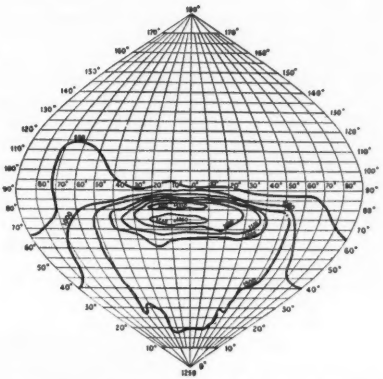
The manner in which the refractor plates are secured to the inner faces of the bowl calls for special mention. A technique has been evolved which has made it possible effectively to "weld" the plates to the bowl with a jointing medium which, on curing, leads to perfectly continuous homogeneity in translation from plate to bowl. The bonding is permanent and remarkably strong. Thus, since each plate is fastened with its prismatic surface adjacent to the inner face of the bowl, the prism faces are completely sealed from dust and moisture. This greatly facilitates the cleaning of the lantern.

Optical Performance

The general distribution of light from the lantern is shown in the isocandle diagram.

The main control of light flux is effected by the refractor plates, while the opal hood serves as an efficient diffuse reflector to the upward light emitted by the lamp so as to give a "fill-in" to the lower hemisphere distribution. The small amount of light diffusely transmitted by the hood gives the lantern a very attractive appearance when the lamp is burning.

The lantern has a luminous efficiency in excess of 80 per cent.



Isocandle diagram for 'SO Fifty' lantern using 230v 140w sodium lamp.

SITUATIONS VACANT

An opening occurs in London for a JUNIOR DRAUGHTSMAN (between 20-25 years of age) for work connected with artificial lighting schemes. Good opportunity for young man who wishes to become a lighting engineer. —Applications, with full details, to Chief Personnel Officer, Crompton Parkinson, Ltd., Crompton House, Aldwych, W.C.2.

ILLUMINATING ENGINEER required for technical sales department of London Fittings Manufacturers, mostly for internal work. Must be capable of preparing lighting schemes and quotations. Permanent and progressive position for man with initiative.—Fullest details in confidence to Managing Director, George Forrest and Son, Ltd., Osborne-road, Acton, London, W.3.

ILLUMINATING ENGINEER (25 to 35 years of age). With good electrical background and conversant with modern lighting practice. Required for the planning, estimating, and supervision of street lighting projects. Applications, giving full particulars of experience, qualifications, age, salary desired, to Staff Manager, Siemens Electric Lamps and Supplies, Ltd., 38, Upper Thames-street, London, E.C.4.

Lighting for Leisure

The increasing use of public buildings for a variety of functions requires a flexible lighting installation to permit proper illumination for dramatic performances, dances, exhibitions, etc.
We shall be pleased to place our long experience in such matters at the disposal of those concerned.

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MANCHESTER, GLASGOW and DUBLIN

New Lighting Installations

A West End Newspaper Office

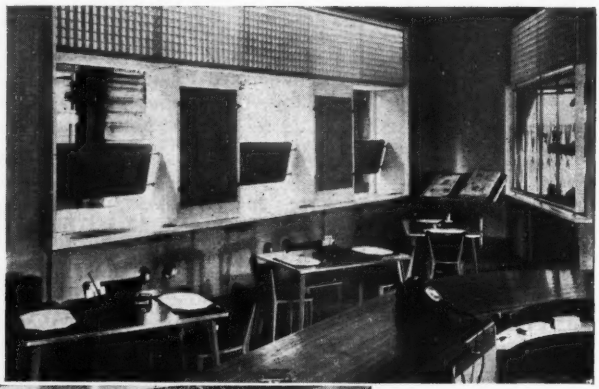
The Regent-street office of the "Evening News" is an excellent example of a new and effective method of combining interior and window lighting.

The five main windows used for display purposes have been constructed with "louvrerall" soffits, the louvres being 3 in. x 3 in. x 3 in. of metal with a white stove enamel finish. This louvre pattern has also been used for the top sections of the window backs, an L section thus being formed in each window. Above the louvrerall soffits are mounted a total of 20 ceiling fittings for 40-watt fluorescent lamps.

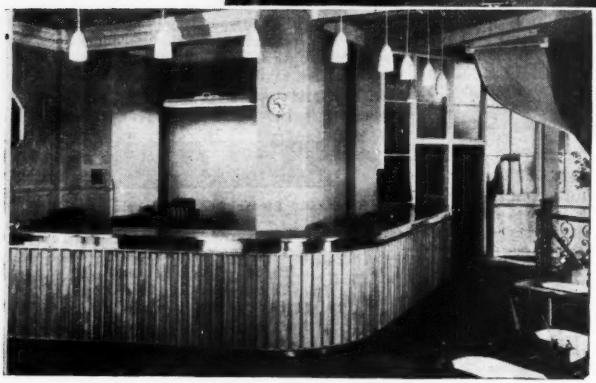
In the general office 14 "Hyliter" fittings for 150-watt internally silvered lamps are mounted on tube suspensions following the line of the curved counter, which is the central feature.

The fluorescent lamps are spaced so as to produce an even brightness on the louvres, and an adequate and evenly distributed illumination in the windows. The general brightness in the windows permits, however, of an effective brightness contrast being obtained when illuminated displays are exhibited in windows.

A diffused illumination is also obtained, from the vertical louvres, in the office interior, the level of illumination dropping towards the centre of the



The "Evening News" Office in Regent Street showing the window lighting arrangement.



Showing the spotlights over the counter.

office. Over the counter the "Hyliter" fittings provide a high illumination value, and the resultant brightness contrast is pleasant and effective, attention at once being attracted to the counter. Glare has been avoided, and the illumination levels have been found satisfactory for the visual tasks involved.

The installation was designed by the architect, Mr. G. Sergei Kadleigh, A.R.I.B.A., and the lighting design was manufactured and installed by Messrs. Courtney, Pope (Electrical), Ltd., in conjunction with the main contractors, Messrs. Cockade, Ltd., who were also responsible for the redesigning of the entire showroom.

Six-lamp (fluorescent) bracket lantern.

The Royal Naval College, Dartmouth

The Royal Naval College at Dartmouth affords a convincing example of the manner in which fittings for fluorescent lamps can be designed to be in keeping with the tradition of famous buildings. In planning this installation the Fittings Dept. of The General Electric Co., Ltd., had the benefit of close collaboration with the Admiralty departments concerned. It was desired that the fittings on the quarter-deck of the college should be reminiscent of the poop lanterns used in old-time warships, and in conjunction with the Admiralty a pattern was evolved which combines modern lighting practice with the appearance of the lantern's prototypes.

Two styles of lantern were necessary, a bracket type and a lantern for suspension from the roof. Both have black bronze finished metalwork and champagne tinted glazing. In the one suspended lantern, which hangs from the vaulting at one end of the quarter-deck, there are 12 3-ft. 30-watt warm white lamps arranged vertically round a central gear compartment. The lantern is approximately 5 ft 9 in. deep and is supported by a tubular suspension. There are also six bracket lanterns (see illustration) each containing six 2-ft. 40-watt warm white lamps. They are similar in style to the suspended lantern, although somewhat smaller, their overall depth being 5 ft.

Quarter Deck Lighting at the Royal Naval College, Dartmouth

Tungsten lighting is blended with the fluorescent on the quarter-deck. The tungsten lamps are mounted in 24 circular fittings, arranged under the gallery and in its vaulted roof. Each fitting houses three 60-watt lamps. The black bronze metalwork and champagne tinted glass match the finish of the lantern type fluorescent fittings.

A design in keeping with the quarter-deck lanterns has been used for the standard fittings mounted on the stone balustrading at the top of the steps leading to the terrace in front of the college. These fittings are in bronze, 7 ft. 6 in. high, and each lantern contains one 200-watt lamp

The library and most of the classrooms at the college are equipped with fluorescent lamps in fittings of special or standard designs. Continuous runs of standard trough reflectors are used in

certain rooms, but in others the fittings were designed specially for this installation. These take two or three 4-ft. lamps, and have a flashed opal glass dish underneath to prevent direct vision of the light source. The effect, also, is to reduce the intensity of reflection from shiny surfaces by distributing the light from the lamps evenly over the whole of the underside of the dish.

In the library a box-type fitting with flashed opal glass sides and ends is used, containing four 4-ft. lamps. The metalwork of the special classroom and library fittings is finished in bronze. All these special fittings for classrooms and library were designed in collaboration with the Director of Electrical Engineering, Admiralty, Bath.

Dartmouth College took early advantage of the relaxed restrictions on floodlighting, for which it is an excellent subject by reason of the commanding position of the buildings on the banks of the River Dart estuary.

The floodlighting installation takes only 7.5 kw. This economy results in part from the fact that there is no competing high-level illumination in the vicinity, but the excellent results are due in great measure to the highly efficient coloured floodlighting lamps now available Most of the lighting is provided by 15 "Osram" 400-watt red floodlights of the hot cathode neon-filled type, but in order to give contrast between the red brick and the stone window facings of the building a proportion of yellow light is obtained by the use of 15 100-watt "Osram" sodium lamps. These lamps are of the latest pattern with a separate vacuum flask jacket to maintain the inner tube at an even temperature. The floodlight units have mirror glass reflectors and heat-resisting front glasses. They are located in the courtyard at a distance of about 20 ft. from the front of the building.

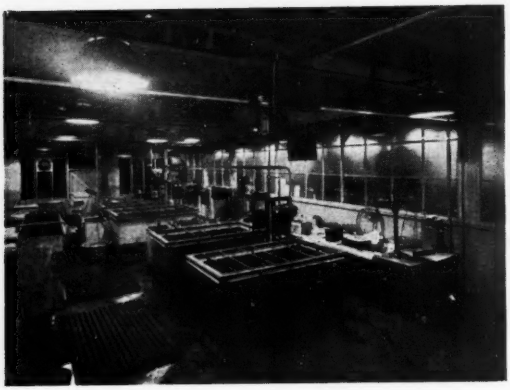
By the combination of red and yellow lighting, the desired contrast between the brick frontage and the stonework facings of the windows has been most effectively preserved and at the same time it has been possible to avoid imparting a pinkish tinge to the stone, which might have been the case if red floodlights had been used by themselves.

Lighting in a Plating Shop

The illustration at the foot of this page shows the lighting in the plating shop of the cutlery manufacturers, Messrs. Latham and Owen, Ltd., Sheffield, one of the few modern cutlery factories built since the war.

The lighting fittings shown are Benjamin Deep Dome Porcelain Well Glass units, specially designed for use in humid or corrosive atmospheres such as plating shops, dye works, etc, the reflector being finished in "Crysteel" vitreous enamel and removable without disturbing the well glass or lamps.

The electrical contractor was H. C. Freeman, Sheffield.



Tungsten lighting in a Sheffield plating shop.

Lighting in the Brabazon Hangar

Description of high bay system

The artificial lighting of the Aircraft Assembly Hall has involved many practical and technical problems necessitating the development of special lighting equipment, the design and application of which has been undertaken by the Holophane Company, Ltd., in collaboration with the Chief Electrical Engineer of the Bristol Aeroplane Company and Consulting Engineers, Messrs. Brian H. Colquhoun and Partners.

The immense size of the Aircraft Assembly Hall can be gauged by the fact that the floor area occupies 7½ acres, comprising three bays, each having a clear width of 330ft., with heights of 83ft. and 117ft. to the eaves and apices of the roof respectively.

The centre bay, employed for detail erecting, has an overall depth of 420ft., and each side bay has a depth of 270ft., one bay being devoted to final assembly, the other being for servicing purposes.

A high standard of visual efficiency with pleasing environment simulating daylight conditions were primary considerations, the achievement of which had to be related to economy of operation and maintenance. The unusual mounting height of the lighting equipment—75ft. above the floor—facilitated the use of high efficiency lamps without risk of glare conditions, and a blended lighting scheme embodying a combination of 1,500-watt tungsten filament lamps and 400-watt mercury vapour discharge lamps was finally decided upon to attain lighting conditions approaching daylight colour, together with economy in current consumption.

Having regard to the fact that the superstructure of the plane reaches a height of 50ft. above ground level, and within 25ft. of the lighting units, the requirements as to satisfactory colour blending and quality of illumination on widely divergent working planes are of an unusually exacting nature.

The lighting units are arranged in groups of three and are mounted over apertures in platforms specially designed in the catwalk layout to accommodate the lighting equipment. Maintenance and relamping of the reflector units can be effected conveniently and with safety on the catwalks, access to which can be

Interior of the assembly hall at night showing the high bay lighting.

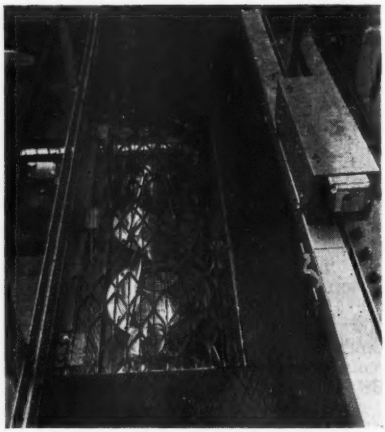
gained by electric lifts from ground level. Each group of units employs one 1,500-watt tungsten filament lamp and two 400-watt mercury discharge lamps, accommodated in Holophane translucent concentrating prismatic reflectors.

The latter, while providing the essential light distribution characteristics and high utilisation necessitated by the abnormal mounting height together with the requirements of satisfactory uniformity of illumination and colour blending, permit of sufficient light in an upward direction for adequate illumination of the roof structure and walkways. Apart from the desirability of suitable ceiling brightness in a lofty building of this nature, the resultant indirect illumination of the walkways, with freedom from distracting visible light sources and obscuring shadows, affords safety of movement for the maintenance staff without the necessity of supplementary lighting equipment.

The design of the prismatic reflector is such that the transmitted light in the upper hemisphere does not in any way prejudice the output efficiency in the lower zone, and it further possesses the important feature that its high initial performance can be permanently maintained.

The groups of three lighting fittings are arranged in rows 50ft. apart, the spacing of the groups in each row being

The 'Holophane' translucent concentrating refractor used in the assembly hall.



Showing a typical arrangement of a group of three lighting fittings mounted in a tray below a walkway. Wiring trunking carrying lighting cables, with control gear and isolating switch mounted above walkway.

16ft. in the centre erecting bay, to provide a service illumination of 20 lumens per square foot. The spacing in each row is extended to 20ft. in the side bays, where an illumination of 20 lumens per square foot is maintained.

The complete installation comprises 428 main lighting groups, each with 2,300-watt loading, and together with the additional demand subsidiary lighting, the total connected load for lighting service is approximately 1,175-kw.

Holophane equipment is further associated with the lighting of the offices and ancillary buildings related to the assembly hall, in addition to the contact lights recessed in two rows approximately 150ft. apart along the length of the Filton Runway.

Another most impressive feature of the assembly hall is the window on the north side. This window, stated to be the largest plate glass window in the world, is 1,052 feet long and 50 feet high. This enormous window, together with windows in the side walls and a certain amount of roof glazing ensures a high standard of daylighting. Nowhere within the hall does the daylight factor drop below 5 per cent., whilst over the majority of the floor it is well above 10 per cent.

A New Lighting Service Bureau in Leeds

On the morning of Thursday, September 22, 1949, the Lord Mayor of Leeds, Alderman Norman D. Vine, J.P., officially opened the new Mid-East England Area E.L.M.A. Lighting Service Bureau, at 24, Aire Street, Leeds, 1, in the presence of the Vice-Chairman of the E.L.M.A. Council, Mr. C. A. Hughes, the Director of E.L.M.A., Mr. W. J. Jones, M.Sc., M.I.E.E., and a distinguished audience of local city officials and those interested in lighting.

The Mid-East England office of the E.L.M.A. Lighting Service Bureau was first opened in 1937 at Circle House, Lady Lane, Leeds, following increasing demands for a lighting information bureau in that area. Mr. J. W. Howell, who was at that time industrial lighting specialist to the London Bureau, was appointed district engineer, and is still serving in that capacity.

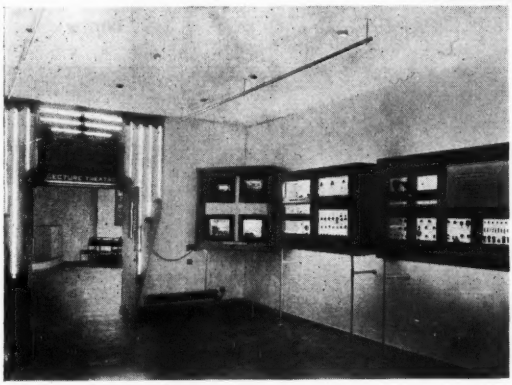
The area now served by the Leeds Bureau is bounded by the coast from King's Lynn to Whitby, the Lancashire border and thence along a line roughly following the Great North Road to Peterborough and east again to the sea.

Apart from the necessary offices, the new bureau consists of an entrance vestibule on the first floor of 24, Aire Street, and on the floor above a shop-lighting section containing a full-scale shop window, a lighting principles and industrial lighting demonstration room, and a well-equipped lecture theatre with a seating capacity of 150. There is also a committee room with a specially constructed barrel ceiling for indirect lighting.

Throughout the Bureau filament and fluorescent lighting are shown side by side, and particular care has been given to the colour of the decorations.

Not only will the new premises make the running of Illumination Design

(Above). Demonstration shop window to show different systems of fluorescent lighting and adjustable filament reflector spot-light lamps.



(Left). Main demonstration room looking towards the lecture theatre.

Courses in Leeds very much easier since the demonstration facilities are better than can be found in any hired hall, but in time it is hoped to stage many special lectures, exhibitions and demonstrations with specialised appeal to such bodies as the National Coal Board, the Cotton Board, the Wool (and Allied) Textile Employers Association, the Yorkshire Electricity Board and the City Lighting and Education Authorities, and many others.

New Showroom at Crompton House

A showroom for the exhibition of lighting and other equipment was opened on September 1 by Crompton Parkinson, Ltd., at Crompton House, Aldwych, W.C.2.

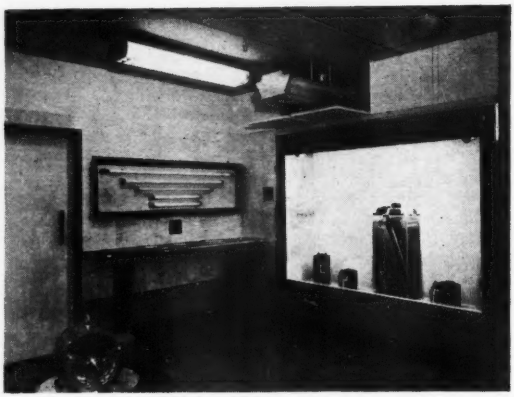
Intended as a convenient centre for the demonstration of the latest techniques of interior and display lighting, the showroom layout has been mainly designed for this purpose. Unlike some lighting showrooms it does not contain a confused array of fittings difficult to view individually—all the equipment is installed for the demonstration of typical results that can be obtained in practice with different lighting schemes.

New types in the range of Crompton fluorescent lighting fittings are displayed either as permanent fixtures or by withdrawing each separately for inspection from a series of compartments in which they are normally concealed (see illustration). With this arrangement each fitting can be viewed individually. It also keeps the main part of the ceiling free for observation of the illumination obtained with the indirect lighting schemes installed.

Different parts of the showroom can be lit by selected forms of lighting equipment arranged to represent typical schemes. One section of the ceiling has an inset lattice-louvre screening fluorescent tubes. This is a recent trend in lighting practice for providing large areas of even and diffused illumination combined with neat and unobtrusive appearance in the modern style. By selective switching of tubes the intensity of the lighting can be varied for different occasions. The arrangement provides for low intensity lighting during the viewing of television to avoid the eyestrain that results from looking at the screen against the harsh contrasts of an unlit room.

Indirect lighting is demonstrated by two separate schemes, one using fluorescent tubes in cornice fittings and the other fluorescent tubes and reflectors concealed in wall recesses. The latest practice in this form of lighting is demonstrated and, using standard fluorescent fittings designed for the purpose, examples are shown of the results that can be obtained with shallow windows—usually difficult to light effectively.

To illustrate the problems that arise in the planning of lighting installations and the methods of solving these problems various simple demonstrations have been arranged. A separate section of the showroom shows industrial fittings for filament and discharge lamps.



Interior of Crompton Parkinson's new London showroom.

Street Lighting in Preston

New fluorescent installation at Fishergate

With the new fluorescent lighting installation at Fishergate, Preston, it was first intended to employ span wires from existing buildings, but an adequate mounting height could not be obtained and a staggered layout of 100-130ft. was decided upon. Particular attention was paid to the fact that a section of the road is one way, extremely congested and with numerous side roads.

Narrow pavements necessitated designing a special column with a small base of 9½ inches. This was produced by Concrete Utilities, Ltd. In conjunction with Siemens Electric Lamps and Supplies, Ltd., a special head was designed, the lantern being bolted direct to the column at a height of 25ft., forming a composite unit of pole and lantern.

The road surface is asphalt carpeting over the original setts and exhaustive tests were carried out at the Siemens Research Laboratories to obtain the best optical construction to promote good visibility.

The design of the lantern embodies several interesting features. It consists of five main sections comprising roof and castings, supports for control gear and reflectors, bottom and side reflectors and two "Perspex" doors. An internal bracket is fixed to the column by four bolts. All control gear is housed in the lantern. The "Perspex" doors open at the bottom for relamping and maintenance.

Three Siemens "Sieray" 80-watt natural instant-start fluorescent lamps are fitted in each lantern and each unit is controlled by a Venner M.S.S.L. time switch with solar dial. Twin cables are brought down each column to facilitate switching off two of the lamps at midnight if desired.

Special consideration was given to the junction at the top end of Fishergate, which, besides being very congested, is a bus loading station.

The whole of the equipment was supplied by Siemens Electric Lamps and Supplies, Ltd., the erection being carried out by Erecon, Ltd., under the supervision of the Preston Corporation Surveyor's Street Lighting Department.

Fluorescent lighting at Fishergate Preston.

I.E.S. ACTIVITIES

Dr. Aldington's Presidential Address

At the opening London sessional meeting held at the Royal Society of Arts, John Adam Street, on Tuesday, October 11, the new President for the 1949-50 session, Dr. J. N Aldington, was inducted and presented his presidential address. The address, entitled "New Horizons in Illuminating Engineering," is summarised below. The full text of the address will be published in the I.E.S. *Transactions* in due course.

Dr. Aldington began by saying that unlike the members of certain other cultural bodies who are concerned almost entirely with material things, the members of the Illuminating Engineering Society have to deal not only with quantities which can be measured and qualities which can be assessed, but also with effects which up to the present have defied measurement and which have proved incapable of description except in the most general terms. Because of this due regard had to be given to the importance of each aspect of every lighting task.

It is of great interest, therefore, to trace how the evolutionary process has controlled and governed developments in the several branches of the lighting engineers' work. In doing this our considerations might be sub-divided into four main sections: the eye, the light source, the lighting fitting and the economic factor. In each of these fields the I.E.S. has the potentiality for providing the conditions which will inevitably reveal those new horizons for which all the work which has been done in the past has been but a preparation and a beginning

The Eye

Not the least remarkable of the properties of the human eye is the comparatively narrow range of wave-lengths within which the visual stimulus is produced. The I.E.S. is vitally interested in the knowledge which is being gained by studies of the behaviour of the eye in its differential response from the two thresholds of 7,000Å and 4,000Å to the maximum of the visibility response curve at about 5,550Å.

Many instruments have been produced which allow the eye to be dispensed with in much photometric work, but we may sometimes overlook the limitations of numerical assessments. Ultimately our figures are no longer intelligible, and we are forced to realise that only the eye computing, measuring and assessing all the facts in a moment of time can say whether our work is good or bad. Studies of the physiology of vision are yielding results of the greatest importance to the illuminating engineer and lead to one of the new horizons which we seek to comprehend.

The Light Source

A number of sources of light have been used in the past, and some are still used to-day alongside more modern sources. The search for more efficient means of producing light has caused various sources to be discarded as our knowledge grew.

The theoretical maximum efficiency of an electrical source of light is 621 lumens per watt. There is, however, a wide gap between theoretical maxima and the efficiency of existing light sources. In the case of the tungsten lamp there are various reasons for this, and it is generally assumed that finality has been reached in this field. It is interesting to note, however, that each of the four historic types of tungsten lamp, i.e., the cage filament and the coiled filament vacuum lamps, and the single coil and the coiled coil gas-filled lamps are still being made. It would seem that there is a need for a single lamp type which would combine the advantages of each of these forms, and that there is still therefore, scope for development in the incandescent lamp field.

With electric discharge lamps there are indications that an efficiency of perhaps 75 lumens per watt might be achieved. New possibilities have been opened up by recent investigations on krypton and xenon, but it is too early to say whether these will result in practical forms of lamps capable of more general usage than the specialised types so far developed.

The theoretical maximum efficiency for fluorescent lamps would appear to be about 66 lumens per watt, and with new phosphors recently developed in this country we are already approaching this maximum. It is unlikely that material increases in the efficiency will be obtained in the future without some

sacrifice in the colour rendering properties of the light source.

The Lighting Fitting

Ideally a lighting fitting should make use of the maximum possible flux from the light source Unfortunately this is seldom the case and too often our light sources are surrounded by fittings which have been designed with little or no attention to the lighting task they are intended to serve. In the matter of fittings design we must remember that the fluorescent lamps, with its widely different geometry and brightness, is a rival to the tungsten filament lamp in the domestic as well as other fields. From the illuminating engineering point of view its introduction for domestic lighting may well be a matter of primary importance and may mark another horizon beyond that which at present limits our field of vision. In the majority of homes lighting is totally inadequate in regard to position of the light source, its brightness and the level of illumination. There is need for a special study of this problem and for a bold attempt to re-educate public authorities, builders, architects, and people generally in the benefits of proper lighting in the home.

Exterior lighting at the moment is almost entirely confined to street lighting, a field in which, for various reasons, there is not at the moment any great extension. Now is the time, therefore, to take stock of street lighting techniques and to seek a new horizon in this field.

The Economic Factor

As a rule it is not possible to produce the optimum illumination due to economic limitations. In every scheme the final effect is achieved as a result of compromise. Members of the Society in their many and varied occupations are aware of the importance of careful budgeting. At the same time the Society is responsible for the maintenance and improvement of the I.E.S. Code, and we must not hesitate to press for a proper appreciation of the importance and urgency of improving lighting standards

Swansea Group

On Thursday, September 22, the Swansea Group held their inaugural meeting by invitation of the Mayor of Swansea at the Swansea Guildhall. In addition to the members of the Group there were present at the meeting the Mayor of Swansea, the President and Secretary of the Society, and representatives of kindred societies, including the E.A.W., the gas and electricity supply industries and others interested in lighting. The total attendance was nearly 60. Before the meeting the visitors were entertained to tea by the Mayor.

The meeting was opened by Mr. S. G. Turner, Chairman of the Cardiff Centre, under whom the new Group will function, who introduced the Mayor of Swansea, who had kindly consented to take the chair at the meeting. The Mayor said that since he had been invited to take the chair he had looked into this question of lighting and the activities of the Society and had then realised how much we all owe to light and its proper use. He recalled his early experiences in the coal mines, and he attributed the incidence of nystagmus largely to the bad lighting they then had to put up with. Lighting, he said, was a vital factor in the problem of increased production with which the country was faced. He said he was glad that the Society had opened a Group in Swansea, and he hoped that it would grow rapidly. He then introduced Mr. Waldram, and called upon him to give his presidential address.

Mr. Waldram prefaced his address by conveying to the meeting the greetings of the I.E.S. Council wishing the Group every success. He then gave his presidential address, the text of which has been published in the *Transactions*. On the conclusion of Mr. Waldram's address the Mayor said that in addition to thanking the Society for starting a Group in Swansea he also had to thank them for giving him an opportunity of hearing Mr. Waldram's brilliant address.

A vote of thanks to Mr. Waldram was proposed by Mr. T. Scott Harrison, a past-chairman of the Cardiff Centre. He said how much they had appreciated the address and hoped that the Swansea Group would have further opportunities of hearing Mr. Waldram in the future.

In proposing a vote of thanks to the Mayor for officiating at the meeting, Mr. G. J. Higgs, Chairman of the Group, expressed the thanks of the Swansea members to the Cardiff Group for their help in forming the new Group. He also said how glad he was to see so many present, including the ladies, an indication of the future success of the Group.

Newcastle Centre

At the opening meeting of the new session on October 5, Mr. A. J. Ogle was installed as Chairman and delivered an interesting address. The theme of the address was a plea for a new approach by the lighting engineer when designing a lighting scheme. Mr Ogle pointed out that a scheme can be both scientific and aesthetic, but that the aesthetic qualities should be more apparent than the scientific. He suggested that the approach to any lighting scheme should be under the following five headings: efficiency, safety, comfort, atmosphere and beauty pointing out that even the plainest industrial scheme can achieve beauty if properly designed.

The point was made that often when an installation fulfilled all the foregoing requirements it became "typed" and monotonous; lighting engineers should be on their guard against standardisation in this respect. Mr. Ogle also referred to the apathy in regard to lighting matters which was found both in industry and in the home, and said that a great deal of educational work would be required before good lighting installations became at all common.

Forthcoming I.E.S. Meetings

LONDON

November 8th
Sessional Meeting. Messrs. M. W. Peirce and D. J. Reed on "Specialised and General Lighting in Hospitals." (At the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2). 6 p.m.

November 23rd
Informal Meeting. A Brains Trust—with a difference. (At the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.) 6 p.m.

December 13th
Sessional Meeting. Messrs. W. A. R. Stoyle and G. D. Jones-Thomas on "The Operation and Maintenance of Fluorescent Lamp Installations." (At the Lighting Service Bureau, 2, Savoy Hill, London, W.C.2.) 6 p.m.

CENTRES AND GROUPS

November 1st
Mr. T. S. Jones on "Shop Window Lighting." (At the Lecture Theatre, Merseyside and North Wales Electricity Board's Showroom, Whitechapel, Liverpool 1.) 6 p.m.

November 2nd
Mr. A. W. Jervis on "Department Store Lighting." (At the Minor Durant Hall, Oxford Street, Newcastle-on-Tyne.) 6.15 p.m.

November 3rd
Mr. J. F. Roper on "School Lighting." (Joint Meeting with the Cardiff Branch of the Electrical Association for Women.) (At the South Wales Electricity Board Demonstration Theatre, The Hayes, Cardiff.) 5.45 p.m.

November 3rd
Mr. W. A. R. Stoyle on "The Operation and Maintenance of Fluorescent Lamp Installations." (At the Agricultural House, Queen Street, Exeter.) 7 p.m.

November 4th
Mr. W. A. R. Stoyle on "The Operation and Maintenance of Fluorescent Lamp Installations." (At the South-Western Electricity Board Showrooms, Bath.) 7 p.m.

November 4th
Mr. J. G. Holmes on "New Definitions and Units of Light." (At the Imperial Hotel, Temple Street, Birmingham.) 6 p.m.

November 4th
Mr. J. W. Howell on "The I.E.S. Code in Relation to Textile Lighting." (At the Electricity Showrooms, Market Street, Huddersfield.) 7.15 p.m.

November 7th
Mr. Clifford Higgins on "Illuminated Signs and Displays." (At the Medical Library, The University, Western Bank, Sheffield 10.) 6 p.m.

November 10th
Presidential Address by Dr. J. N. Aldington. (At the Demonstration Theatre, East Midlands Electricity Board. Leicester Sub-Area, Charles Street, Leicester.) 6.30 p.m.,

November 10th
Prof. H. Hartridge on "Recent Advances in the Physiology of Colour Vision." (Joint Meeting with the Institute of Physics, Manchester and District Branch.) (At the Reynolds Hall, Manchester College of Technology, Sackville Street, Manchester.) 6 p.m.

November 14th
Chairman's Address by Mr. A. G. Smith. (At the Lighting Service Bureau, 24, Aire Street, Leeds 1.) 6 p.m.

November 16th
Mr. G. A. Eveniss on "Light and Photography." (At the Technical College, Neath.) 5.30 p.m.

November 16th
Visit of the Tees-side Group to "Odeon" Cinema Operating Box and "Empire" Theatre Backstage.

November 18th
Birmingham Centre Ladies' Night.

November 23rd
Mr. E. A. Langsdon on "Cold Cathode Lighting Equipment." (Joint Meeting with the Royal Scottish Society of Arts.) (At the Welfare Club Hall of the City of Edinburgh Lighting and Cleansing Dept., High Street, Edinburgh.) 7 p.m.

November 24th
Mr. E. A. Langsdon on "Cold Cathode Lighting Equipment." (At the Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank Crescent, Glasgow, C.2.) 7 p.m.

November 24th
Mr. A. L. Randall on "Tracing of Faults on Fluorescent Systems." (At the East Midlands Gas Board Demonstration Theatre, Parliament Street, Nottingham.) 5.30 p.m.

November 24th
Mr. C. Higgins on "Illuminated Signs and Displays." (At the Yorkshire Electricity Board, 45/53, Sunbridge Road, Bradford.) 7.30 p.m.

December 1st
Mr. C. H. Edlin on "Light as an Aid to Crime Detection." (At the South Wales Electricity Board Demonstration Theatre, The Hayes, Cardiff.) 5.45 p.m.

December 1st
Mr. F. G. Copland on "Analysis of Lighting Problems in an Industrial Undertaking." (At the Agricultural House, Queen Street, Exeter.) 7 p.m.

December 2nd
Mr. F. G. Copland on "Analysis of Lighting Problems in an Industrial Undertaking." (At the Grand Hotel, Bristol.) 7 p.m.

December 2nd
Mr. H. B. Mellor on "The Lighting of Road Transport Vehicles by Fluorescent Lamps." (At the Electricity Showrooms, Market Street, Huddersfield.) 7.15 p.m.

December 5th
Mr. P. L. Ross on "Fluorescent Lighting in Mines." (At the Medical Library, The University, Western Bank, Sheffield 10.) 6 p.m.

December 6th
Mr. G. W. Galley on "Theory Into Practice." (At the Lecture Theatre, Merseyside, and North Wales Electricity Board's Showroom, Whitechapel, Liverpool 1.) 6 p.m.

December 8th
Mr. P. Corry on "Lighting Aids to the Visual Art of Stage Production." (Joint Meeting with the British Drama League.) (At the Reynolds Hall, Manchester College of Technology, Sackville Street, Manchester.) 6 p.m.

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The EDITOR Replies

From the comments we hear by some critics of fluorescent lighting, we can only conclude that what they appraise is not the lighting but merely the lighting units. We have heard it said that architects "loathe" fluorescent lamps, but this is a generalisation it would not be hard to disprove. Architects do, of course, rightly attach considerable importance to the appearance of lighting units and, no doubt, they do not use fluorescent lamps where they would be incongruous. But before the advent of the fluorescent lamp filament lamps of much the same length and appearance were marketed and actually known as architectural lamps. Moreover, many of those used were of opal glass and gave diffused light, as do fluorescent lamps.

In his presidential address to the I.E.S. this month, Dr. Aldington made reference to the survival of the unpleasing term "fittings," which is still widely used as a generic name for the class of things in which we enclose or partially surround our primary sources of light. Such expressions die hard, but we much prefer "lighting units," which is the expression used in the I.E.S. code. A lighting unit can, of course, be a bare lamp, but generally it is a lamp plus some sort of reflector, refractor or diffuser, but in any case it can properly be termed a lighting unit.

The fourth "leader" in "The Times" can always be relied upon as something of an antidote for any depression engendered by the news reported in other columns. But, besides the wit of these delightful leaders, they often remind us, in unexpected ways, of impressive truths. It is worth quoting an October one on "The First Fire": . . . "with the first gentle purring of the humble gas fire we are creatures radiant and transfigured. How right was the gentleman in Isaiah who exclaimed, 'Aha, I am warm, I have seen the fire!' 'Seen' is the material word. Long before the modest warmth, which is all we allow ourselves, has had time to permeate the room, the sight of that red and glowing jewel, guarded by its cold white portcullis, has sent our spirits soaring." How right is the writer when he says "seen" is the material word! To sight, and therefore to lighting, we owe so many of the pleasures we experience.

Some of these pleasures depend especially upon artistry in lighting. As we go to Press, we are reminded of this by the report in a London evening paper that two famous English ballet stars refused to appear at the recent opening night of the Monte Carlo Ballet in Paris because they objected to the lighting. In the theatre, performers and producers know how much lighting "effects" matter, though, evidently, they do not always agree on what these effects should be. In other applications, artistry in lighting is often sadly lacking.

The most casual reader will, we are sure, have noticed that this issue of the journal makes quite a feature of public lighting. In spite of the restrictions of the past few years and our continued reluctance to spend money, we wonder whether our street lighting, in London at any rate, is not better than the majority of us think. We are prompted to make this comment after having observed that instead of reverting to the headlight they used before 1939 the London trams are still using the small, hooded aperture they adopted during the war. Trams cannot wander aimlessly about the roads like other vehicles, but the driver is just as anxious to know what lies in front of him—and apparently he finds the street lighting adequate.

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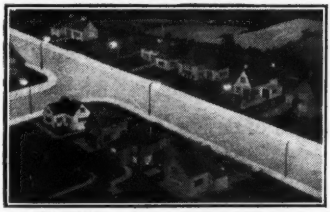

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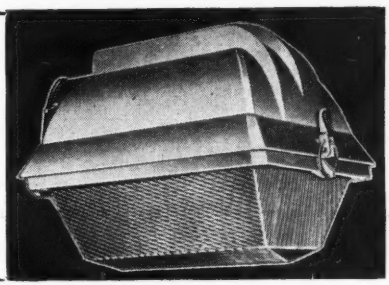

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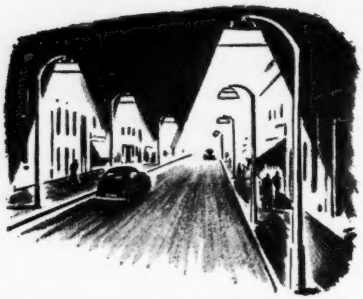

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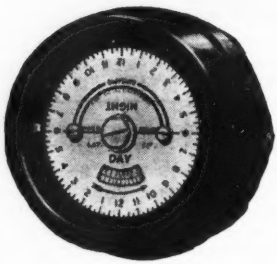

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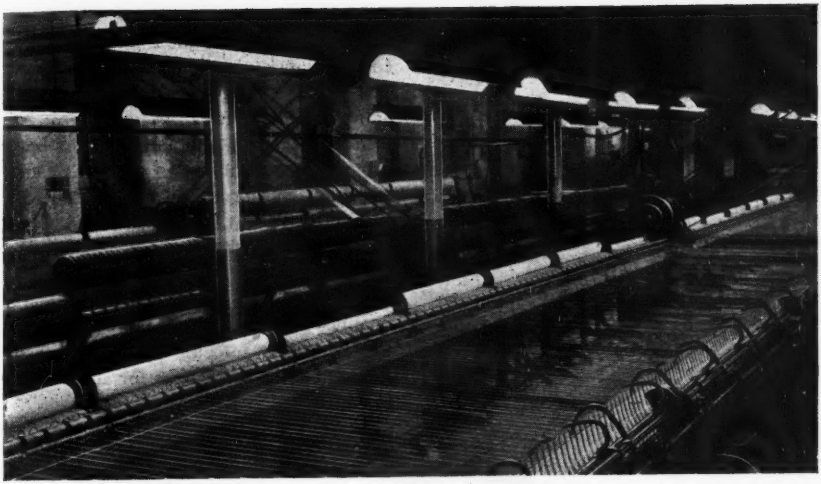

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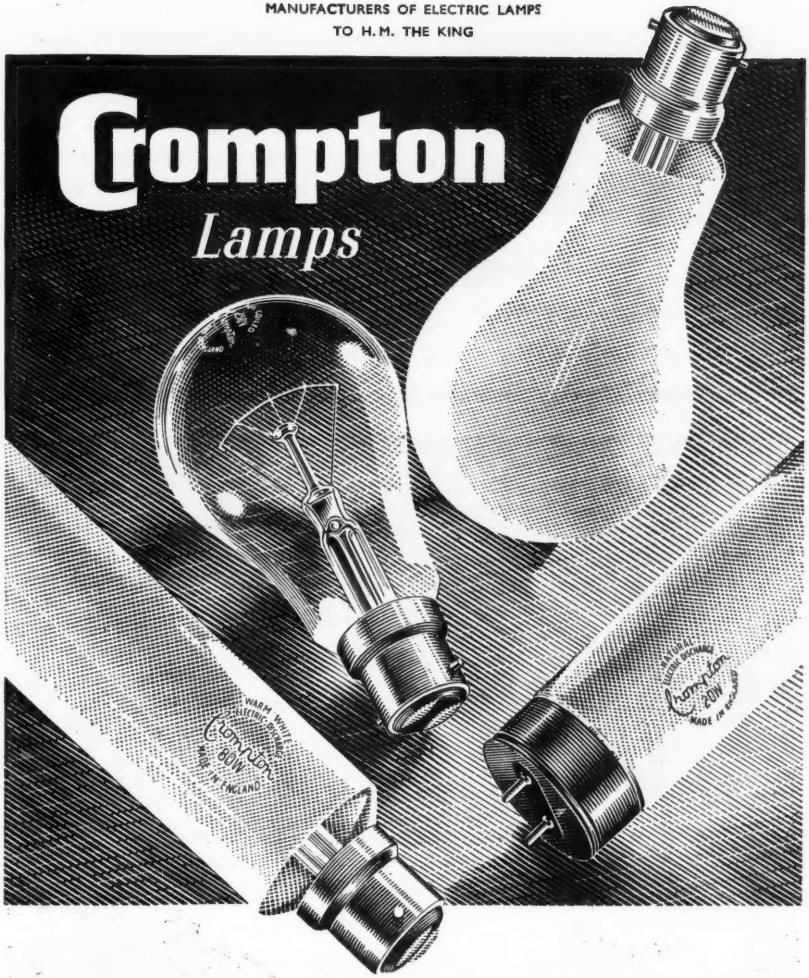

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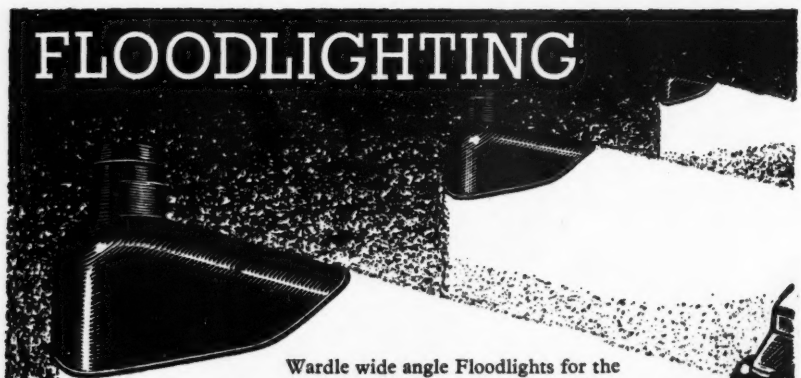

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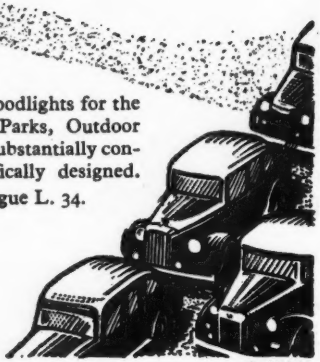

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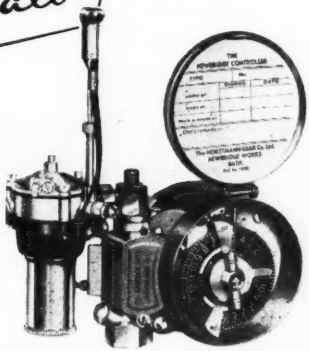

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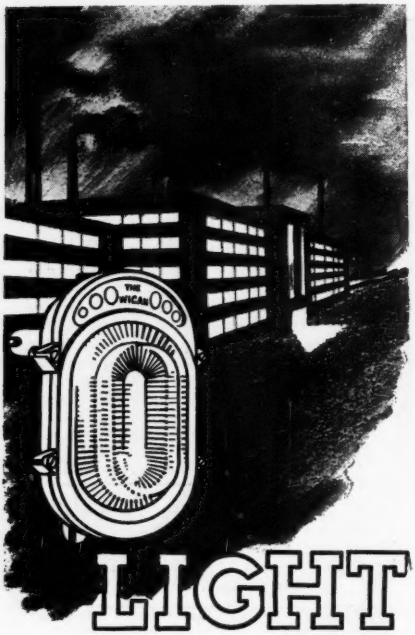

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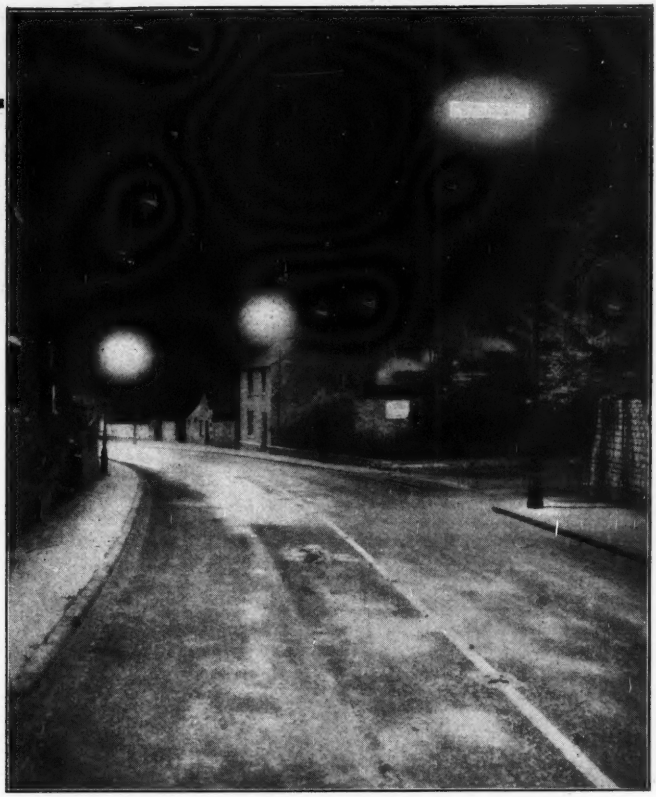

Revo

'SOL-ETERN' AGAIN . . .

This photograph shows the excellent results obtained by the recent installation of eight Revo "Sol-etern" lanterns at Corby, Nr. Kettering. Each lantern carries two 5ft. 80-Watt fluorescent lamps, and good visibility and uniformity of brightness are obtained, while the total load for the complete installation is only 1.54 Kw.

The scheme is planned in accordance with the M.O.T. Final Report to provide 4280 lumens per 100 ft. linear road.

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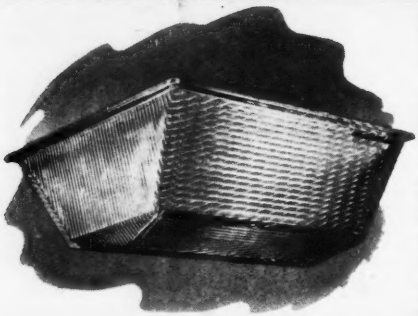
Photograph by courtesy of the Engineering and Lighting Equipment Co. Ltd., St. Albans, showing an installation of Lancaster Controller cut-off Lanterns embodying Holophane Refractors, in Eastern Avenue, Woodford.



The prismatic glassware employed is the Holophane Controlled cut-off Refractor (Cat. No. 2/4255D) for Horizontally-Mounted Mercury Discharge Lamps. Light control is effected by the prismatic refractor shown on the left, which forms the lantern bowl. The prisms, which are the basic feature of the Refractor design, are almost entirely on the inner surface, the outer surface being substantially smooth and presenting no projection on which dirt can accumulate.

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